THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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IRON AND STEEL INDUSTRY, THE MACHINERY TRADE AND KINDRED INTERESTS.

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CLEVELAND, O., NOVEMBER 21, 1889.

THE WEEK IN IRON CIRCLES.

General Features. The speculative influences in the Southern iron market emanating from the East, mentioned in our last report, have been significant features in the week under review. One offer for 20,000 tons No. 2 foundry, at $14.75 cash, Birmingham, warrant deliveries, was refused by a Birmingham furnace, which, in turn, was asked to name $15. This would be about $18 cash, Cincinnati, or $2 per ton higher price than lately. The Eastern buyers are credited with wanting large blocks at their prices, so that it seems apparent either that Northern consumers of Southern iron must seek supplies from other districts for a time, or put a sharp advance on ruling prices. There is much to support the bull view of the market. Stocks are undeniably very light, and demand for actual consumption is very heavy. Prices are still below the corresponding period of two and three years ago and lower than afford much profit to many furnaces, with the rapidly advancing tendency of raw materials, transportation, etc. At Cincinnati Bessemer iron is again strong and advancing. Ohio softeners are being slowly marked up. Charcoal irons are the slowest to improve, but are in active demand at higher prices. Every visible tendency of the market is toward improvement. The little show of hesitation that appeared in the Chicago market a week or two back has given place to renewed confidence and active buying all along the line. No large contracts are reported this week, but there has been steady demand, and buyers have not been afraid to take hold of moderate lots at prices that two weeks ago would have been rejected. There is nothing in sight at present to check this hopeful feeling, and most dealers expect a slow and steady advance in prices. The threatened advance of freight rates from all Ohio furnaces to the Northwest created some stir, but it was decided on Wednesday at Chicago to continue current rates. Leading Lake Superior charcoal furnaces are holding firm at $21, cash, at Chicago for next year's deliveries. While the volume of business at Detroit has been somewhat less for the past week than a few previous weeks, yet the market remains strong, and it is hard to find a furnace-man who is willing to sell for delivery after January 1. This is the case even where an advance is offered over present rates. The feeling seems to be general among all sellers that prices will advance still further early in the year, and they are therefore refusing to book orders ahead. Notwithstanding the very large production at this time, stocks do not accumulate, and the outlook certainly favors the manufacturer of almost any grade of pig iron. The week under review has been one of marked activity at Louisville, there having been in the neighborhood of 20,000 tons of iron sold in that vicinity, mostly for prompt or near by deliveries, while one or two furnaces sold round lots through the entire year ot 1890 at about $1 above early delivery iron. Grey forge sold in lots ranging from 500 to 5,000 tons equal to $17.50 for future, and $16.50 to $17.00 for early delivery, showing the confidence of almost all in the market and the belief that the future will bring higher prices still. English iron cannot enter this country for less than $28 to $30; besides, iron in this country has not advanced by considerable in proportion to the English. The supply in both countries seems inadequate for the demand. Our Louisville correspondents learn that there have been recent contracts let for nearly 100,000 cars to be built. This will require, say, 500,000 tons of pig iron. Offers and reports from almost every direction show strong, active, advancing markets. One furnace refused an offer for 3,500 tons, one-third each grey forge, mottled and white, at $17.50 cash, Louisville, as basis of delivery during the whole of next year. On the whole, the market is strong, advancing and excited. During the past two or three weeks, at Pittsburgh, transactions in pig iron have been comparatively light, as consumers were well supplied and preferred to hold off and watch the market, believing that raw material had gone quite as high as it was likely to for awhile and that there might possibly be some reaction. Prices have, however, been well maintained and there is no sign of weakness among any of the standard brands. On account of the speculative buying of Southern irons at the furnaces, nearly all quotations at St. Louis have been withdrawn and business is at a standstill. Consumers are not sharing in the excitement and are disposed to take their chances later. The boom in English pig iron markets has apparently run its course, and the expected collapse has come. There is, however, a solid substratum of demand abroad for all kinds of iron, and a partial recovery will no doubt speedily follow.

Iron Ore. Since the report of last week, the four mines on the Marquette range, upon which the Schlesinger syndicate was reported to hold options, have become the property of the syndicate, the total purchase price being $755,000. This gives to the syndicate the Dunn, Armania, Chapin, Iron River, Florence and Youngstown, on the Menominee range, and the Queen, Prince of Wales, Buffalo and South Buffalo, on the Marquette range, with a total record of ore mined, during 1889, of 1,200,000 tons. The shipping season is about to close, and next week will be the last of it. This week some 30,000 tons of ore came down, and about 15,000 tons is expected next week. The chances are that the last Escanaba freights will be $1.25. It is safe to say that the close of navigation will find at Lake Erie ports less unsold ore than at any time since the beginning of this industry. This fact, coupled with the largest output on record in the Lake Superior country, disposes of the claim of speculative mining, no less than it demonstrates the wonderful growth of the home market and of its consumption in the iron trade. The additional wants of the new furnaces in the Central West, now building, already call for an increased output next year of from 800,000 to 1,000,000 tons, while everybody is agreed that Eastern steel makers will have to look for their supply of ore almost entirely to the Lake Superior country, so that, barring accidents, a moderate estimate for the output of 1890 is 9,000,000 tons, which is probably too low a figure. It may be interesting in this connection to note that during the season of 1889 about 275,000 tons of non-Bessemer ore went over the mountains, while the prospects are good next year of sending a million tons beyond the Alleghenies.

Pig Iron. The market is still quiet, but prices have stiffened up and an advance is noted of half a dollar all along the line. Bessemer is very strong at $21 to $21.50 cash at the furnace, for spot delivery, while nobody cares to engage his product for any length of time ahead. One sale is recorded of a round lot of Bessemer for delivery running into May, at $23.50 cash at the furnace. The advance in Bessemer naturally carries with it other grades and furnace-men everywhere look for a material advance within the next three weeks. The consumption of pig iron continues without abatement and in excess of manufacture, thus effecting a still further reduction in stocks.

Merchant Iron. There is a healthy demand in every line of this market, but without any special features. Bar iron is still a trifle behind in price, while sheets are as scarce and as high as ever.

Hardware. Metals are on the advance and shelf goods have felt the benefit of the raise of the raw material. There is a large trade in heavy hardware. Wire nails are held at $2.90 in car lots at the mill, and will go higher. Gas pipe is scarce and strong.

THE BEAUTIES OF PIG IRON SPECULATION.

The collapse of the Scotch pig iron boom, the past week, was the natural result of the high-handed manner in which the warrant market has been manipulated of late, across the water. It is, indeed, the best possible commentary on the scheme now being foisted on the American iron trade, whose object, as frankly avowed by the Secretary of the New York Metal Exchange, is "to systematize, and, so far as possible, foster speculation." The London *Iron and Steel Trades Journal*, which has been admiringly quoted by the *Age of Steel*, of St. Louis, as in favor of this sort of thing, in its issue of November 2 makes no concealment of the ill effects of the rabid speculation which has afflicted the British iron markets during the past two or three weeks. It begins a leader on the subject by remarking that "the gamble in pig iron has been fast and furious this week," and it plainly says: "If we search for any specific reason why Scotch warrants should have advanced to 60s. this week, and have subsequently receded to 57s., we can find it only in the supposition that speculators for a rise were anxious to secure the profit which 60s. would afford them, and in 'unloading' their holdings they unwillingly knocked out the market to 57s." Concerning the effect of these speculative advances on the general market, it says: "It is a noteworthy fact that though the speculation makes the market, and fixes the daily quotations for Northern iron, the smelters quietly follow the warrant market and advance their prices with every rise in warrants, and ignore the inevitable but temporary reactions which occur at some period in every week; so that, though warrants go up or warrants go down, the makers' prices go up, and up only. They secure all the advances which the warrant market gives them and and ignore the slight relapses, but the result in the end is the same. Our advices from the Midlands record a general advance of 5s. per ton in all classes of forge and foundry iron, and even greater advances are notified by some makers. The result of this rise in raw materials is that producers of finished iron cannot entertain business at prices which only a month since would have represented desirable business. The Birmingham Exchange yesterday was a scene of 'mild,' if not 'wild' excitement, and, as noted elsewhere in our columns, everything was up, and many makers were too much upset (in their calculations) to quote prices for their producers, and wisely decided to withdraw all quotations—*pro tem.* The action of the pig iron makers rendered a revision of the selling prices of finished iron absolutely necessary, and the iron manufacturers seemed nothing loath to run up their quotations. The tone of the market at Birmingham, yesterday, savored less of the steady and gradual improvement which has been the feature of the year, and more of the 'leaps and bounds,' which have been regarded as injurious to the best interests of the trade."

The *Journal*, about a year ago, characterized the Scotch warrants as a "wet blanket" on the trade. From the above *resume* of the situation it would now appear that they have the effect of highly inflammable material, generating a fire that for a time got entirely beyond the control of the speculators themselves. No wonder that such "leaps and bounds" are considered "injurious to the best interests of trade."

TWO GREAT IRON COMBINATIONS.

The past week has developed two great iron combinations that cannot but affect, in a marked degree, the trade immediately connected therewith. Without vouching for all the printed statements made, it appears that the Federal Steel Company, with a nominal capital of $12,000,000, has been organized for the purpose of controlling the manufacture of barb fence wire and wire nails in the United States, and that it has reached such a point in its development as to leave little doubt regarding its success. According to the Cleveland *Leader*, $6,000,000 of the nominal stock will represent the value of the real estate, buildings, machinery, and good will of the absorbed companies. From $4,000,000 to $6,000,000 will represent the cash paid in by investors. It may be that not more than $4,000,000 in cash will be needed as working capital and for buying outright the plants which owners will not exchange for the new company's stock. A contract has been made with the banking firm of Drexel, Morgan & Co. for the cash capital. The bankers will receive for their money its equivalent in preferred stock. The $6,000,000, representing the value of the plants, will be issued as common stock of the consolidated company. Common stock will be given in exchange for buildings, machinery and real estate. Finished stock on hand, ready for shipment on January 1, when the Federal Steel Company will begin operations, and raw material, were not taken into consideration when the appraisal committees fixed the valuation of plants, and they will be regarded as cash and paid for in preferred stock. Preferred stock will draw seven per cent. interest, which must be paid from the profits. If a dividend is declared, it will be paid upon the common stock up to seven per cent. If there is still a surplus remaining, a dividend will be paid upon preferred and common stock alike.

Among the concerns mentioned as interested in the combination are the Cleveland Rolling Mill Company; the HP Nail Company, of Cleveland; the American Wire Company, of Cleveland; the Salem Wire Nail Company, of Salem O.; the St. Louis Wire Mill Company, of St. Louis; the Oliver and Roberts Wire Company, Limited, of Pittsburgh; Lambert and Bishop Wire Fence Company, Joliet, Ill., and others. It is said that every one of the nine steel rod mills in America has entered the new corporation.

Close upon the heels of this announcement comes that of a combination of the leading forge companies of the United States. *The Iron Trade Review* has been aware of the fact that, for more than a year past, efforts were being made in this direction, and now the statement is being made that the following concerns have come into the central organization: The Cleveland City Forge and Iron Company; Erie Forge and Iron Company, Erie; Helmbacher Forge Company, St. Louis; Delaney Forge and Iron Company, Buffalo; W. S. Sizer, Buffalo; Nassau Iron and Steel Company, Nassau, N. H.; Bridgeport Forge Company, Bridgeport, Conn.; Central Forge Company, Whitestone, L. I.; Paterson Forge and Iron Company, Paterson, N. J., and the Duquesne Forge Company, of Pittsburgh. We think we can add the name of the Akron Steam Forge Company, of Akron, O., but do not make this statement from direct authentic sources. There are upwards of fifty forges of all kinds in the country, but many of them are simply small affairs for manufacturing iron direct from the ore; all the really large concerns are represented in the above list, the Cleveland City Forge and Iron Company alone producing probably one-third of the output of the forges of America. The object of the combination, in a word, is to work by co-operation, and put a stop to disastrous competition.

WAGES IN HUNGARY.

To the kindness of Hon. Joseph Black, recently United States Consul at Buda Pesth, we are indebted to the following details of the brick industry, as carried on in Hungary. The figures were furnished by the Steinbrucher Dampfziegelei-Gesellschaft, having kilns in Steinbruch and Rakos.

PLANT.

Ten stoves, fired continuously; 3 brick machines, with steam power; 2 engines, aggregating 170 horse power; 8 hydraulic dry presses, for the manufacture of art material.

Annual product (brick)	30,000,000
Hands employed	1,100 to 1,300

LABORERS' WAGES.

Weekly (and by the piece, man and wife)	$6.00 to $8.00
Daily—Men	40c.
Women	24c. to 28c.
Children (not under 13 years)	16c. to 20c.

MECHANICS' WAGES (WEEKLY).

Carpenter	$ 3.60 to $4.00
Machinist	3.60 to 4.00
Blacksmith	3.60 to 4.00
Harness-maker	4.00
Brick mason	3.60
Stoker	3.20 to 3.60
Engineer	6.00
Chief engineer (per annum)	440

Free lodging and heating furnished to all employes, as well as free medical treatment and medicines.

NEXT SEASON'S IRON ORE OUTPUT.

A New York correspondent writes us a series of questions regarding the Lake Superior iron ore trade which betray an amazing amount of ignorance at the metropolis regarding this important industry. We summarize the inquiries and answers as follows:

1. Will the output of 1890 reach 12,000,000 tons? Answer: No. Present indications point to a total output for 1890 of from 8,500,000 to 9,000,000 tons.

2. Of the total product, will 2,000,000 tons go to Chicago? Answer: No. We would say probably 1,500,000 tons.

3. Of the balance, will 6,000,000 or 8,000,000 tons go to Cleveland? Answer: By no means. Probably 7,000,000 to 7,500,000 tons will come to lower lake ports, of which Cleveland will, no doubt, receive 1,200,000 tons. Of the total, Ohio and Pennsylvania furnaces will probably take 6,000,000 tons, and from 1,000,000 to 1,500,000 will go over the mountains to Eastern furnaces. It is a fact not generally

appreciated, that the furnace capacity of the Central West has been increased by 900,000 to 1,000,000 tons per annum.

4. What will be the freight rates by water on ore in 1890? Answer: Probably $1.25 to $1.75 or $2.00, according to the port from which shipments are made.

AS OTHERS SEE US.

In its current issue, the *Metal Worker* has a chatty letter concerning Cleveland, from which the following is an excerpt:

Cleveland does not expect to have any more circuses—that is, shows of the itinerant variety. The city may get up a circus of its own some time in the future—in fact, there have been one or two partial rehearsals already. But outside shows are not to be allowed the use of the streets of the city. To keep the shows out, and reserve all the grand and lofty tumbling and the performances of electrified horses to the city itself, the streets have been carefully overspread with an ingenious net-work of wire, some 20 feet above the ground. Looking up, one is reminded of the ropes and nets that are stretched on the occasion of a trapeze performance. The wires are so low down that the Goddess of Liberty in her chariot could never go under, and to guard further against invasion the wires are all charged with deadly currents of electricity. Better protection against the inroads of traveling shows, like circuses, could hardly be desired, and the city fathers are to be congratulated upon their happy forethought. Meanwhile, the street car companies are putting motors into their cars, intending to utilize a part of the electric current these wires carry for driving their cars, thus dispensing with horses. Occasionally a portion of the wires falls to the ground, resulting in the death of a horse or two. This, of course, helps the car companies to get rid of their surplus animals. No men, I believe, have been killed yet, but as they follow New York fashions out there I suppose that will come along in due time. Iron posts set in the edge of the sidewalks serve to support the net-work of wires already mentioned, and the local newspapers are pathetic in their appeals to the public not to monkey with the posts. Cleveland votes for Chicago as the place for holding the World's Fair in 1892, and altogether seems to be in a happy frame of mind.

The Forest City, as Cleveland is poetically called, is perhaps as favorably situated for the manufacture of stoves as almost any other point with which it may be compared. Indeed, some of its citizens claim for it advantages possessed by no other place. They point out its most excellent shipping facilities both East and West, as well as to the South, and dwell particularly upon the fact that the city stands on a line at which different supplies very naturally meet. The best brands of pig iron, for example, are on one side, while cheap fuel of excellent quality is on the other. And yet at present there is only one stove manufacturing concern in the place. The history of the stove business in Cleveland illustrates in a marked degree the vicissitudes to which that industry is liable.

Safety Apparatus for Boilers.

A safety apparatus for boilers has been patented by Mr. F. Walter, of Essen, Germany, who has perfected and protected in this country several forms of apparatus for automatically giving signals when the water level falls below a certain limit, and for admitting either steam to the fire-box or a further supply of water to the boiler. One is an electrical apparatus for giving warning of the reduction of level. A steam pipe is lead from the boiler at the point of minimum water level, and is carried to a chamber mounted above the boiler in any convenient situation. The chamber consists of two metal plates, between which is held a flexible diaphragm, one side of which is constantly acted upon by boiler steam, which enters through a pipe direct from the boiler. A rod is attached to this side of the diaphragm, and a valve or plug is fixed to its opposite end. Ordinarily, the pressure on the diaphragm is much greater on the left hand side than on the right. When, however, the water in the first-named steam pipe falls out into the boiler, the steam passes up to the right hand side and equalizes the pressure. The diaphragm is thus pushed to the left, and a plug opened to allow the steam to escape into a curved tube. The tendency of this tube to rectification causes an electrical contact which immediately rings a bell. Another application of the apparatus is for supplying water to the boiler at this juncture. When the steam escapes past the plug, it enters a water tank. There are two valves above and below the tank for the entrance and exit of the water. The action of the entering steam is to close one and open the other, and thus to force the stored water through the pipe into the boiler. A pipe with a cock is sometimes put to connect the two steam pipes referred to, so that the apparatus may be shut off from the boiler for testing. —[Glasgow Engineer.

Maussier Aluminum Process.

According to the Paris correspondent to London *Industries*, the Maussier aluminum process is coming to the front, for it is announced that one of the largest engineering firms has undertaken to work it on an extensive scale. The process, he continues, comprises three distinct periods and kinds of operations—the desilification, the reduction and the liquation. The desilification is effected by means of fluorine, or flouride of calcium, at a high temperature in the presence of carbon. Lime, or the carbonates of potassium, or sodium, may be added to facilitate the decomposition of the silicate. The reduction or expulsion of the oxygen is obtained by means of iron and manganese raised to incandescence in the presence of carbon. The liquidation, the object of which is to separate the aluminum from the iron and the manganese, is effected by dropping the molten mass into carbon ingot molds. These molds are made of wood charcoal. The aluminum so obtained is nearly pure.

AT a Perm (Russia) factory a 50-ton hammer is in use.

CONDITION OF THE BLAST FURNACES OF THE UNITED STATES.

November 1, 1889.

[CONDENSED FROM THE AMERICAN MANUFACTURER.]

LOCATION OF FURNACES.	CHARCOAL. Total No. of Stacks.	CHARCOAL. In Blast. No.	CHARCOAL. In Blast. Week'y capacity.	CHARCOAL. Out of Bl'st. No.	CHARCOAL. Out of Bl'st. Week'y capacity.	BITUMINOUS OR COKE. Total No. of Stacks.	BITUMINOUS OR COKE. In Blast. No.	BITUMINOUS OR COKE. In Blast. Week'y capacity.	BITUMINOUS OR COKE. Out of Bl'st. No.	BITUMINOUS OR COKE. Out of Bl'st. Week'y capacity.
New England	14	7	666	7	550					
New York	9	1	237	8	989	4	2	1,699	2	2,274
Pennsylvania	21	8	483	13	810	1	1	747	0	0
Upper Susquehanna Valley						1	0	0	1	200
Pittsburgh						20	20	22,494	0	0
Spiegel						1	1	718	0	0
Allegheny Valley						2	1	597	1	125
Shenango Valley						20	15	10,722	5	2,216
Youghiogheny Valley						5	5	2,130	0	0
Juniata and Conemaugh Valleys						22	12	5,462	10	4,064
Spiegel						1	0	0	1	250
Maryland	9	2	207	7	565	5	1	395	4	1,326
Virginia	22	6	305	16	936	14	10	5,046	4	1,408
North Carolina	2	1	153	1	240					
West Virginia	3	0	0	3	190	6	2	1,444	4	1,845
Ohio—Mahoning Valley						15	13	10,123	2	1,285
Eastern, Central and Northern						17	13	9,637	4	3,304
Hocking Valley						15	4	1,306	11	2,487
Hanging Rock	15	7	473	8	765	14	7	1,393	7	1,768
Miscellaneous	1	0	0	1	200					
Kentucky						4	1	501	3	600
Hanging Rock	2	2	176	0	0					
Western Region and Miscellan'ous	2	0	0	2	154					
Tennessee	9	5	1,205	4	355	11	10	5,397	1	450
Georgia	2	1	175	1	98	2	1	552	1	675
Alabama	13	10	2,295	3	710	36	24	14,840	12	7,002
Indiana						2	1	188	1	231
Illinois						16	11	12,899	5	2,907
Michigan	25	12	4,076	13	4,093	1	0	0	1	300
Wisconsin	5	3	1,534	2	392	4	4	1,847	0	0
Minnesota	1	0	0	1	140					
Missouri	3	2	677	1	240	6	2	1,142	4	2,455
Texas	2	1	210	1	100					
Oregon	1	1	160	0	0					
Colorado						2	0	0	2	960
Utah	1	0	0	1	80					
Washington	1	1	225	0	0					
Total charcoal and coke	163	70	13,257	93	11,607	247	161	111,279	86	37,532
Total anthracite	189	98	38,181	91	23,235					

SUMMARY.

FUEL.	IN BLAST. Number.			IN BLAST. Weekly Capacity.			OUT OF BLAST. Number.		OUT OF BLAST. Weekly Capacity.	
		Month Previous.	Year Previous.		Month Previous.	Year Previous.		Month Previous.		Month Previous.
Charcoal	70	66	75	13,257	12,672	14,035	93	97	11,607	12,071
Anthracite	98	98	97	38,181	36,496	28,442	91	91	23,235	23,818
Bituminous	161	149	141	111,279	104,378	88,273	86	98	37,532	44,086
Total	329	313	313	162,717	153,546	130,720	270	286	72,374	79,975

HOME-MADE TIN-PLATE.

The recent announcement of the intended application of the Norton fluid-metal process to the manufacture of steel is received with skepticism and even with ridicule. Those who were ignorant of the attempts, which had been made by the most accomplished metallurgists of the world to solve the problem of rolling molten metal at one operation into finished forms, regarded the Norton process as a chimera or the wild fancy of a disordered brain. Hence, they derided it. The project meant such a complete revolution of existing methods that they could not conceive it possible or feasible. When they afterward learned that so eminent a metallurgist as Sir Henry Bessemer had devoted years to develop a practical method of accomplishing this result, with partial succes, they did not acknowledge the ignorance of which they stood convicted, but immediately accused the American inventor of claiming credit which did not belong to him. English journals have regarded the possible results o the Norton process with mixed feelings. Some regard it as a menace to British interests and warn their readers to be prepared for serious inroads on the business of manufacturing tin-plate, to which it is believed to be specially adapted. Others insist that it will amount to nothing, inasmuch as Bessemer's fluid-metal rolling-mill process is open to the use of anybody without royalty, and yet no one cares to adopt it.

The inventor is himself abundantly able to conduct the necessary experiments, even though considerable expense may be involved. If he succeeds in practically demonstrating the feasibility of his process as applied to steel, he will effect a revolution in certain branches of metallurgy. It will not fall still-born, as steel manufacturers are prepared to adopt it in their works as soon as all difficulties are surmounted and it is shown to be a commercial possibility. Those who are now at work on the experimental plant are fully aware of many troubles which will have to be overcome, and are prepared to encounter others which will not manifest themselves until active operations are begun, but they are not daunted. The exceeding cheapness with which sheet-steel suitable for tin-plate promises to be made by this process is an object worthy of their supremest efforts, and they will be entitled to high honor at the hands of their countrymen if the manufacture of tin-plate is, through their agency, impregnably established on this side of the Atlantic.

MOLDS for casting iron can only be made in sand. Iron or other metallic molds chill the iron, and it does not fill well. The great heat at which iron melts will burn any other material, or will stick so as to break the mold.

IN Missouri telephones cost $4 per month in towns of less than 5,000 population, and $3 in towns having 5,000 people.

PNEUMATIC MOULDING MACHINE.

At the meeting of the Manchester Association of Engineers, held on October 26, Mr. George R. Broadheath, Manchester, read a paper descriptive of a new pneumatic method of moulding, which is being introduced by the Pneumatic Co., of Indianapolis, Ind. This machine is designed for moulding any class of patterns, and its chief feature is the ramming by automatic pressure. This is effected by having india-rubber bags fixed in the upper part of the head, in which air at 50 lbs. pressure is admitted. Several of these machines are at present in use at the works of Messrs. Marshall, Sons & Co., Gainsborough, and of these machines Mr. Richards gave a description. The machines in use at Messrs Marshall's works are of a rotary type, that is, the machine has two heads, which are coupled and swiveled on a suitable centre. While one head is being rammed up, the box on the other is brought under a hopper, in which the mixed sand has been fed by an elevator. By the withdrawal of a simple slide, sand is admitted, and the ram of the other box being coupled, the head is swiveled and brought under the ram, and thereupon rammed up. By the adoption of automatic pressure, it is claimed that more uniformly cleaner moulds are formed, and that more uniform castings are produced. In working the machines at Messrs. Marshall's establishment, five men are employed to each machine, and it was stated that they can produce 40 to 50 boxes per hour of eccentric clips, 8 to 12 inches in diameter and 2 inches deep, whilst the machine could also be used with equal facility for loose patterns. Messrs. Marshall speak very highly of the machines, and consider that they have saved them a considerable amount of money. Examples were given of the productions of the pneumatic machine in various classes of work, and specimens of various kinds of castings from foundries in America and Gainsborough were also shown, but some of them came in for criticism, as not being of a very excellent quality. In the discussion which followed upon the reading of the paper, some criticism was passed on the relative cost of the pneumatic system as compared with other methods at present in use, and, although the general tenor of the remarks was favorable to the pneumatic machines, considerable doubts were expressed as to whether, considering the cost which would be entailed in putting down the pneumatic plant, it would really be more economical than other existing machines. There was no doubt that the pneumatic machines would possess great advantages for special classes of work, and would be a great acquisition to foundry plant.—[Glasgow Engineer.

HOW STEEL TIRES ARE MADE.

The Latrobe Steel Works, at Latrobe, Pa., have erected buildings with the latest and best machinery for the manufacture of steel tires for locomotive and car wheels. Much of this machinery was constructed from original designs—the outcome of long experience and careful investigation into the processes most successfully employed, both in this country and abroad. As a result, they have to-day the finest and most modern plant of its kind in the world. The buildings stand upon a level piece of ground, some 70 acres in extent, and are placed well apart, and every provision seems to have been made for future growth and extension, so that each department may be enlarged without encroaching on its neighbor.

The melting shop is 175 feet long by 131 feet wide. This is entirely of iron, and is particularly lofty and well lighted; in fact, in all the buildings special attention seems to have been paid to the comfort of those occupying them, and the abundance of room, fresh air and light is one of the most noticeable features in the design. The melting shop contains two 15-ton Siemens-Martin melting furnaces, with their necessary drying ovens, reheating and sand calcining furnaces. Each melting furnace has its own casting pit, with one ladle crane and four 7-ton pit cranes. These are the Aiken type of hydraulic cranes, and all those belonging to one furnace are operated from one pulpit. Each heat from the melting furnace is cast into ingots, one for every tire to be made. These ingots are at once removed, weighed, carefully inspected, and chipped when necessary, and stored in the yard, where they are handled by means of a traveling crane. As they are selected for orders, they are taken to the forge, a building 300 feet long by 131 feet wide, similar in general design to the melting shop. In the lean-to, or shed, on one side of the forge building, are placed the Babcock & Wilcox boilers, with the feed pump and pumps for supplying water under pressure to the hydraulic system, which is carried all through the works. At the end of the forge nearest their storage yard, the ingots are charged into "continuous" furnaces, from which (by means of automatic cranes) they are delivered to the 20-ton steam hammer. This hammer is a truly magnificent tool. Under it the ingot is upset or flattened by a few blows into a cheese about six inches thick, which is immediately punched. During this operation of punching both the bloom and punches are handled by a most ingenious combination of hydraulic machines, with which a man and a boy do work which ordinarily requires the exertions of six or eight men, and do it, besides, far more accurately and expeditiously. One is lost in admiration at the almost human intelligence exhibited by the centering crane, which, with its driver on its back, manipulates the punches, blooms, etc., with a minimum loss of time or labor.

The bloom, having been punched, is transferred to a 7-ton steam hammer, where it is hung upon the horn of an anvil and (being in the meantime rotated) is beaten upon its tread until its internal diameter is sufficiently enlarged to allow it to be placed on the rolls at the mill. During this operation the flange is roughly formed. After this operation the bloom is again laid down and carefully inspected, after which (if it passes muster) it is again charged in a heating furnace, from which it is transferred to the tire mill.

This mill, like almost all the other special machinery about the works, was designed by their chief engineer, Mr. Julian Kennedy, and is probably more powerful and thorough in its work than any other which has been yet built. Its rolls compress the bottom and top, center and tread of the tire simultaneously, exerting a pressure of from 90 to 150 tons, as may be required. It is very rapid and accurate in its work, and turns out finished tires whose smoothness and perfection surprised the experienced railroad men who saw them. The mill is driven by a double 26x42" engine of 1,000 horse-power.

At the hammers, heating furnaces and mill, and scattered thickly through the forge, are numerous hydraulic cranes of the Aiken type, varying in their details, however, to suit their different services. Tires which require no machine work upon them, are taken directly from the mill to the shipping wharf. If, however, they are to be bored or turned, they are conveyed to the machine shop, a brick building 130 feet long by 60 feet wide, which is certainly a model of its kind. Like the other buildings, it is commodious and airy. It is well-lighted by large windows at the sides and ends, and sky lights in the roof, and is warmed by a constant supply of fresh air heated by a steam coil and forced to all parts of the building through a rotary blower. The shop contains a 4-foot planer; three lathes of 20-inch, 38-inch and 48-inch swing; a radial drill; pipe and bolt cutters; tool grinding machine, and eleven special tire boring and turning mills, made by Wm. Sellers & Co. Five of these have tables 80 inches in diameter, and six have table 60 inches in diameter. These tools are driven by a 14x20" engine, of 140 horse-power, and are covered by over-head railways and cranes carrying pneumatic hoists. A well-equipped and organized tool room serves the shop; as well as the outside fitters, etc. In one corner stands a 100,000-lb. testing machine, in which a bar is broken from every heat cast at the open-hearth furnaces, before any of its metal is permitted to be used. After the tires have been machined, they are removed to the shipping wharf, where they are assembled, sorted in sets, painted and loaded upon cars.

In addition to the buildings above mentioned, there are ample storage sheds, carpenter shop, pattern shop, blacksmith shop, stables, etc., etc., as well as a roomy and comfortable office, with drawing room, and well-equipped laboratory.

A careful and accurate record is kept of all material in all stages of manufacture, from the ore in the stock yard to the finished tire in the cars. No material is charged into the melting furnaces until its chemical composition is ascertained, which is subsequently checked by a careful analysis of each heat cast, from which also one or more test bars are broken. Until this has been done, and the results laid before and passed upon by the manager, no ingot can be hammered, and it is safe to say that before a tire is shipped everything has been done that can be, to insure its fitness for the work to be required of it.—[Railway Review.

The American Market Independent.

In view of the excited condition of the British iron and steel market and the comparatively placid state of affairs on this side of the Atlantic up to the present time, our manufacturers cannot help remarking upon the advantageous position occupied by the American consumers of iron and steel. If this country had continued its dependence upon foreign sources of supply for staple goods, such a crisis as the cable now portrays in England would necessarily have been intensified here. Prices would have gone up by leaps and bounds and there would have been no remedy except abstention from buying. This would have meant a decisive check to progress and perhaps a ruinous blow to many enterprises depending on a regular supply of iron and steel. The industrial independence achieved by America has never been more strikingly manifested than at this time. In many branches of the iron and steel trades prices abroad are higher than at American works. This is an anomalous condition of affairs which cannot long continue, it may be presumed, but that it has actually occurred is one of the most striking events of the times. Its portentous significance is overwhelming to those whose experience goes back but twenty years in the American iron trade. In that short time how remarkable a change has taken place!—[Metal Worker.

The Color of the Eiffel Tower.

The color of the Eiffel Tower, says *Invention*, quoting from an exchange, has been one of the puzzles of the Paris Exposition, no two persons agreeing as as to what the color is. Some people imagine that it has been plated with nickel or silver, while others call it red, and others again think that it is of a beautiful bronze color. The fact is that it is painted in five shades of the same color, modulated with the skill that the French often show in cases of the kind. From the base to the first platform, the color is a dark "Barbedienne' bronze, verging a little to red; thence to the second platform the color is the same, but lighter, and from this point to the top the color grows constantly lighter, by five successive gradations, the top being almost a golden yellow. Three coats of paint are spread over the entire surface, and over all is a coat of very hard, transparent varnish, which, by reflecting the sun, adds to the difficulty of defining the color with precision. The varnish is a new, patent compound, we believe, but it is said to have borne the severe tests of use on the iron work of the tower extremely well.

The Fowler Steel Wheel.

Last week the Fowler Steel Wheel Co., of Chicago, had in operation its new furnace, which operates on the Robert process, for making cast steel for car wheels. Several castings were satisfactorily made, and with the exception of the facilities for handling the material, the apparatus is in good working order. Improvements are being made daily, and all of the machinery is being put in condition for regular business. The shops are located near Burnside, on the Illinois Central railroad, not far from the Nickel Plate shops. Several large buildings contain the machinery for rolling the wheels, the furnaces for heating, pits for annealing, blowing engines, stationary boilers, cupola, converter, and the few machine tools. The men in charge of the work are gradually becoming used to the new process, and each succeeding blast is better than the previous one. The firm is now in the market for orders, and has laid out the plant for a capacity of 200 wheels per week.

AMONG THE IRON MINES.

Lake Superior Mining Notes:—

VERMILION RANGE.

Saturday night flames came shooting up No. 8 shaft at the Minnesota mine and in four minutes the shaft house was burned to the ground. But the flames continued to pour out of the shaft, like those from a blast furnace, all that night and a part of Sunday; even yet the fire is not entirely out, although as far as can be seen everything is completely burned. The fire started on the second level and before the men could even run the car out of the cage, the flames came roaring up the shaft. At the third level four men were working, but they escaped by the underground passage. Everything is at the bottom, filling up the shaft from the fourth to the third levels, and the loss can not be fully learned until the fire is out and the condition of the walls ascertained. The origin of the fire is not known, but attributed by some to spontaneous combustion, although more reasonably by others to the carelessness of some miner with an oil lamp. No. 8 was the most productive shaft of theMinnesota and delay meant additional loss. Chief Carpenter Frazer already has a crew of men at work getting everything in readiness for a new shaft and house as soon as the fire is extinguished and the debris taken out.—[Journal, Tower, Nov. 14.

MENOMINEE RANGE.

The former owners of the Chapin mine are exploring near Iron Mountain, have met with encouragement in their search, and hope to soon be able to add another property of value to the Menominee range. N. P. Hulst, a gentleman of recognized ability in the mining world, has direction of the work.—[Mining News.

The new shaft at the Caledonia has reached a depth of 65 feet. and is now 55 feet in ore. There is no change in the appearance of the product, the ore continuing uniformly clean and first-class in every respect. Supt. Calhoun will sink 100 feet and then drift across the vein. The shaft has been enlarged to 7x9 feet and is being timbered. Nine buildings have been erected at the new "location" and things are beginning to "hum."—[Mining News.

Another working shaft has been commenced at the Shafer mine, having been started from the bottom, and in the southeast corner of the open pit, and will be run down to the depth of the second level, which is soon to be commenced. A greater part of the Winter's work will be more of a preparatory nature, and will be confined largely to that part of the mine east of the open pit. The vein is shown to be 150 feet wide, and as progress is more eastward the ore becomes richer in iron. As depth is reached the ore becomes less hard, and finally merges into a quite soft material which is not the best of ore. At the completion of the preparatory work in progress, the Shafer will be in better shape to mine its product than ever before.—[Range.

GOGEBIC RANGE.

The Colby is now supplied with a new outfit of electric bells, which, after a thorough test, are found to work to perfection. The electric wires running underground into the mine, so commonly in use, but so difficult to keep in reliable working order, have been discarded, the connection being made above ground by means of a "pull" wire reaching up through the shaft. Buttons are placed at the surface and skip landings and also within reach from the cars standing at the chute, for convenience in signaling from any of these points. The improved device is the work of Assistant Superintendent J. D. Gilchrist, formerly of the Commonwealth, and reflects much credit on his ingenuity and skill.—[Mining News.

The Della option, near Upson, is just now the center of a good deal of general interest and a particular satisfaction to its owners. A fine vein of an excellent quality of ore was struck early in the week, and is now being opened up. As is now coming to be generally known, the iron deposit on this side of the range does not—at least near the surface—lie next to the solid foot wall, but at a distance of something like 200 feet to the north. This fact led to the abandonment of work in the old shaft, which had been sunk to a depth of 100 feet, and the starting of the shaft, or rather test pit, in which the ore was reached at a depth of less than thirty feet.—[Pick and Axe.

Good ore has been struck at White's mine. They are down 140 feet and it has now become a fixed certainty that this mine will be shipping ore before the end of 1890.—[Ashland Press.

Litigation, growing out of some irregularity in the transfer of stock, will probably take the Iron King, one of the prominent Gogebic mines, out of the list of producers for a time.—[Norway Current.

MARQUETTE RANGE.

The new management of the Norwood mine is putting in new machinery, and making preparations for extensive operations during the Winter.—[Mining News.

The Nidaros Exploring Co. is a new organization perfected for the exploration, in Marquette County, for mineral. The association is a co-operative affair, and has in its membership some of our brightest young Scandinavians of this city. They start out on a perfect business basis, and we hope they will be fortunate enough to discover something that will be of value to them. We wish the boys success.—[Record.

The "Kilworth" property, that was explored by several Ishpeming people, who operated under the above title, has been taken hold of by a new party, the old one having given up its option. Those now in charge are Capt. W. J. Officer, E. P. Foster, W. Fairbairn, J. Brooks and John O. Flack. The location is a favorable one, being but a short distance northeast of the Winthrop mine. It is said that ore of good quality has already been found by the new pool.—[Iron Ore.

The Merryweather, to the west of the old Saginaw, says the *Iron Ore*, is showing up finely. As noted in our report of a few weeks since, the north side of the shaft showed considerable rock, while to the south some 30 feet of ore was clean. A drill hole put into the north side of the shaft, Thursday last, after cutting a few inches of rock, encountered ore of the same fine quality as further south, and up to the time of our going to press, several feet had been cut with the drill still in ore. There is a big vein of ore here pitching to the northwest, and the prospects that a fine mine will be the result grow brighter each day. To the east and west of the shaft, on surface, the ground is being opened across the strike of the vein with the object of finding the extension of the ore in those directions.

The sale of the Prince of Wales mine, located in the East Negaunee range, is announced. The price as given to the public being $200,000. While the terms of sale have been agreed upon, the transfer has not yet been made, we hear, the purchasers desiring to settle the question of title to their satisfaction. One of the points that arise is the interest held by the Breitung estate. Upon arriving at the age of 21, the son of Mr. Breitung will be able to fully legalize all transactions in which he is concerned. His youth causes much annoyance at present. The Prince of Wales consists of 30 acres in the northeast quarter of the southeast quarter of section 5. The explorations thus far made are favorable for the existence of a mine, the ore of which is similar to the Queen, which it adjoins, and from which drifting was done that found the ore. The Schlesinger syndicate are the purchasers.—[Iron Ore.

Lake Superior Shipments of Iron Ore:—

Shipments of iron ore from the mines of Lake Superior, for the season of 1889, up to Wednesday, November 13th, are as shown by the appended statement, condensed from the Marquette *Mining Journal:*

MARQUETTE RANGE.

American	15,614	Grand Rapids	5,007	Queen	54,607
Angeline	19,178	Hartford	566	Republic	262,866
Barnum	6,435	Humboldt	15,866	Republic Reduction Co.	22,326
Braastad	96,700	Jackson	68,838	Riverside	3,712
Buffalo	39,950	Lake Superior	51,670	Salisbury	56,666
Buffalo, South	9,126	Lillie	32,568	Samson	449
Cambria	62,160	Lucy	27,007	South Buffalo	56,013
Champion	202,747	Marquette	59,927	Superior	219,396
Cleveland	253,303	Marquette Ore Co.	5,169	Volunteer	55,484
Cliffs shaft	118,527	Michigamme	48,431	Webster	448
Curry	16,671	Milwaukee	50,513	West Republic	1,509
Detroit	6,065	Negaunee	74,553	Wetmore	18,612
Dexter	3,895	North Champion	7,757	Winthrop	23,467
East Champion	2,697	Pitts. & L. Angeline	202,501	York	12,844
East New York	22,497	Prout	7,997		
Edison	893	Quartz	491		
Total, Marquette Range					2,379,434

MENOMINEE RANGE.

Aragon	613	Half & Half	5,691	Norway	65,708
Armania	45,051	Hamilton	8,347	Paint River	28,049
Chapin	469,698	Iron River	160,475	Perkins	10,826
Commonwealth	98,759	Ludington	99,239	Shafer	9,773
Cyclops	33,991	Mastodon	59,997	Sheridan	504
Dunn	141,000	Mastodon, South	2,604	Sturgeon River	4,775
Florence	167,607	Millie	12,276	Vulcan	147,648
Great Western	35,813	Monitor	11,843	Walpole	9,616
Total, Menominee Range					1,630,179

GOGEBIC RANGE.

Anvil	36,114	Iron King	40,827	Pence	77,077
Ashland	217,646	Ironton	8,636	Ruby	9,474
Aurora	183,967	Montreal	10,097	Section 33 south	45,223
Brotherton	53,226	Norrie	546,331	Sellwood Colby	25,603
Cary	43,753	North Montreal	26,499	South Colby	50,035
Colby, Beaver	44,676	North Section 33	24,295	South 15 Colby	10,280
Germania	98,248	Odanah	4,446	Windsor	14,576
Globe	9,814	Pabst	91,846		
Iron Belt	48,037	Palms	10,203		
Total, Gogebic Range					1,730,938

VERMILION RANGE.

Chandler Mine	299,339	Minnesota Iron Co.	515,748	Pioneer	3,144
Total, Vermilion Range					818,251
Grand Total					6,558,793

Ore shipments for the season are about at an end. There will be a few more cargoes sent forward from this port and Escanaba, possibly enough to add another 100,000 tons to the total already reached, but another week's work will practically bring the season to a close. The rail shipments for the year will be quite likely to round out the 7,000,000 tons that the output of the mines for 1889 has been expected to reach, and this will be about 2,000,000 tons over that of last year.

Manganese Ore.

In 1868 54,000 tons of manganese ore were imported into England for generating chlorine, but since then the introduction of the Weldon recovery process has reduced the import to 7,000 tons in 1888, this amount being sufficient to make up for the current loss occurring in the Weldon process and for some other chemical purposes. In recent years the manufacture of ferromanganese has given rise to a new and large demand for rich manganese ores. For this purpose their value depends not on the amount of peroxide present, but on the total percentage of manganese. John and H. S. Patterson report that manganese ores are now imported into Great Britain from Spain, Portugal, Hungary, Greece, Canada, New Zealand and Australia, but by far the greater quantities come from Caucasia and from Chili. During the year 1888, 85,000 tons were imported, of which 25,000 tons came from Chili. A characteristic of these ores is the large percentage of protoxide of manganese they contain. Several large deposits of manganese ores, containing between 30 and 40 per cent. of manganese, with a large percentage of calcium carbonate, have also been discovered in Chili, but as yet only the richer ores can be profitably exported. Should the means of transport become cheaper, these poorer ores may possibly come to the English market.

THERE has lately been introduced in London a new process of decoration and color-printing on metal, perfected by M. C. F. Josz, C. E., of Brussels. It consists in preparing zinc or other metallic plates in a special way and then either nickel-plating or coppering them, a dull or a bright surface being produced by mechanical agency. Specially prepared enamel colors are used, and the printing of the subject on the plate is carried on as in lithography. Embossing can be effected either in the lettering or in views, etc., this part of the treatment being obtained by another detail of the process, the usual steel plate engraving being dispensed with.

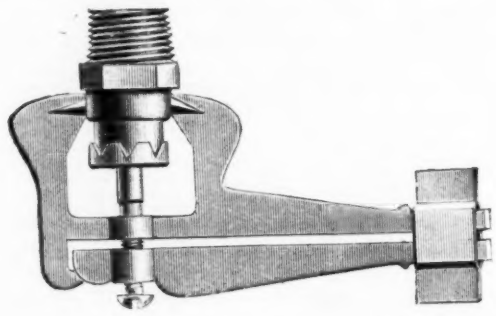
THE BARNES' AUTOMATIC SPRINKLER.

The accompanying cut shows the Barnes' automatic sprinkler closed. It is a neat, strongly made brass sprinkler, the thread stem indicating the portion screwed into the pipe fitting. The toothed cup in the center of the sprinkler is the spraying cup, which, when closed, makes a water-tight ground metal seat against the water joint, but which, when opened, falls down truly and perfectly to its seat, being governed by the turned stem, thus making a serrated spraying cup that breaks the water into a fine spray which covers the ceiling and extends evenly out on each side of the sprinkler from eight to ten feet. The spraying cups in some devices often fall unevenly and the water is not properly distributed. The Barnes' cup cannot fail to seat itself perfectly. The effect of this spray is not merely to put the quantity of water on the fire, but it also fills the air with moisture, thoroughly destroying the elements of combustion in the air, and the fire has no fuel to feed upon.

The valve is held closed by a loose lever beneath a fixed lever arm, the one end resting loosely on a lug and the remote end held by a thin metal fastening that fuses when the heat strikes it.

It will be seen at a glance that there are no complications about the sprinkler that could possibly occasion failure or make it only partially act. Every movement is positive and cannot fail.

To the non-expert, however, attention is called to two facts: First—That the lever is so long and the fulcrum so near the brass lug that the strain, in

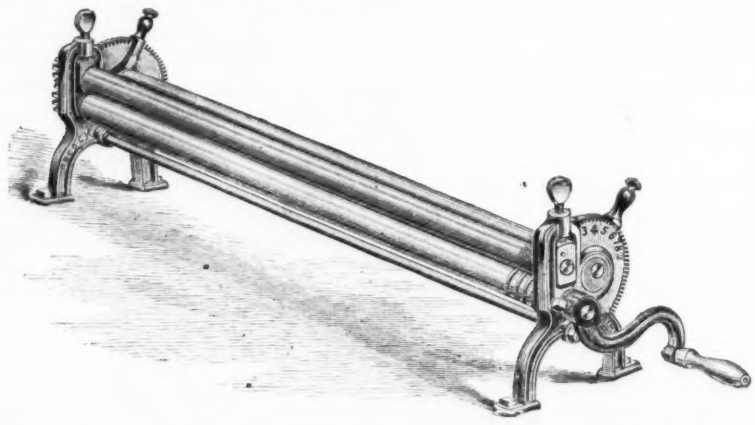


screwing the valve up to make a water-tight joint, is taken away from the fusible metal. This is an absolute necessity as the metal is weak in tensile strength, liable to crystalization and to become friable, and the strain upon it is reduced to the minimum.

The long arm removes the fusible metal from the sprinkler head, and when the releasing device of the sprinkler is opened by heat and lets go, it goes to pieces all at once. This is absolutely necessary also, as the failures that have occurred in sprinklers have arisen from the fact that the sprinkler valve, only partly opened by the heat, allowed enough water to escape to cool the fusible metal, and the valve stuck, simply slobbering water and rendering no service in the extinguishment of fire. Manufactured by the Barnes Automatic Sprinkler Co., Cincinnati, O.

NEW ECCENTRIC FORMING MACHINE.

In the machine herewith shown, the back roll, being moved by eccentrics instead of screws, can be changed instantly from the smallest circle to the passing of a straight sheet (or any circle between), by one movement of the eccentrics; also, the stands being indexed ensures the rolls being parallel



one with the other. These machines are made in different sizes and lengths, but the 30½ inch by 1¾ and 2 inch rolls are always kept in stock. It was awarded first premium and silver medal at the Cincinnati Industrial Exposition, 1884. Manufactured by Oliver Pocock, 386 Hopkins street, Cincinnati, O.

THE REVIVAL IN THE IRON TRADE.

The one distinctive feature of the iron trade which would justify the belief that the activity which now pervades every branch of that industry possesses stability, is the steady decline observable during the last few weeks in the stocks of iron at the public stores. In this respect the recent improvement differs from most of the improvements which have preceded it for a long while past, inasmuch as stocks are being now worked off through a genuine home consumption and not through the requirements of foreign countries, as was the case in 1879. There is, however, a danger that the notion that we are rapidly approaching such another revival, as distinguished theyear referred to may induce a feeling of over-confidence, and that the pace may be so forced as to work much mischief to the iron and cognate industries. The rush of speculators to dabble in iron warrants and the shares of some well-known iron and steel companies, *de faute de mieux*, is an instance of the harm that may sometimes be done to legitimate trade by disorganizing the market. Operations of this kind may, for a time, succeed in inflating prices—as they appear to have done lately in some of the chief centres—but they are destined sooner or later to be followed by the inevitable reaction.

It is unnecessary to point out that no elevation of prices that may result from the manœuvres of speculators can lend permanence to any improvement in trade, and that the only satisfactory test of such improvement must be looked for not so much in an enhancement of values as in a reduction in the enormous stocks of iron which for so many years have fettered the British iron industry. So long as these stocks are undiminished, a genuine revival is out of the question; when they are beginning to disappear, as seems to be the case just now, the case is entirely different, and it is safe to assume that the prospect is very satisfactory indeed. The question arises, how far is the movement towards the exhaustion of stocks likely to go? The answer is that stocks will continue to be reduced only so long as the present activity in the home trade endures. Despite all these satisfactory results, however, there still remains an enormous quantity of iron in the public stores—over a million and a half tons—without reckoning stocks in makers' hands, and before a "boom," as the phrase goes, can be appreciably felt, very much of this iron will have to be got rid of. As the shipments do not show any very large increase, it is evident that it is to the home consumption we must look to reduce the stocks to any material extent. There is no question that all branches of industry consuming iron and steel are remarkably active at present, but that this activity will last long enough to clear off the enormous accumulations of stocks, or any very large proportion of them, may well be questioned. Apart from this, however, the prospect is highly gratifying, and without anticipating any great "boom," we may reasonably look forward to the maintenance of the present revival for a considerable time to come.—[Iron & Coal Trades Review (London).

An Engine-Room Conversation.

"Say, John, the superheater is leaking."

"So? How did that happen?"

"I don't know just exactly, but as soon as the pipe became red-hot, the steam blowed out of the patch."

"H'm, didn't you put on that patch?"

"Yes; and tried the best I could."

"Well, tell me how you did it, and I may be able to help you."

"There ain't much to tell about it. The pipe was cracked about 1½" long, and badly burned. I fitted a piece of ¼" sheet-iron about 6" long snug half around the pipe, filled in with red lead, and tightened the patch with three clamps. When the job was done I turned on the steam, left it under 70–80 pounds pressure for about one hour, and there wasn't the slightest leak. But when I started the fire under it, the steam temperature rose to about 900°, the patch commenced to leak so badly that I had to pull the fire."

"And what are you going to do now?"

"I think I'll try litharge instead of red lead."

"Nonsense, my boy, just sit down and think matters over for a minute."

"What do you mean?"

"I think that red lead or litharge don't agree together with a red-hot pipe. See, here I have an old, cracked elbow, we'll split it into halves, and now we have two crucibles. In one we put a little red lead, in the other a little litharge, and shove them in the boiler furnace. Now the iron is red-hot; we take them out, and we find no red lead or litharge, but a little dust or powder, and molten common lead. Do you understand, now, why your patch didn't hold tight? You use steam at atemperature of 1,200°, and lead melts at about 612°. Red lead (Pb_3O_4) and litharge (PbO) are protoxides of lead, and their fusion point is about the same as that of the latter, hence your failure."

A piece of sheet asbetos made a durable and tight joint.—[American Machinist.

Iron Works in Canada.

A Montreal exchange says: The idea is once more being strongly advocated in Ontario that, inasmuch as immense quantities of iron girders, railway iron, etc., are annually brought into Canada, there is no reason why they should not be rolled in this country, and that a judicious amendment to the tariff would speedily bring about this result. If it be only possible to augment the number of our paying industries we should be prepared to support to the utmost of our ability anything that would tend to that result, but if we are only to build up a sickly interest or to be the means of establishing trusts and rings that can only live by a system equivalent to dead robbery, we should say that it were better to hold off. Meantime, it is for the Minister of Finance to continually investigate our tariff conditions, so that he may, both by the addition and augmentation of duties and by the lowering or entire removal of imposts, place our manufacturing interests upon the best possible footing.

The Crystallization of Iron.

Mr. Thomas Morris, F. G. S., of the Pearson & Knowles Co.'s works, Warrington, England, read a paper before the Liverpool Engineering Society, on Wednesday, last week, on "Some Causes of the Crystallization of Iron" Mr. Morris, whose long experience in iron manufacture entitles his opinions to be received with respect, contends that the well-known brittleness frequently developed in iron is the result of excess of oxygen during the puddling process; overheating in the mill and axle forge furnaces; compression, as in the case of the inside of links of chains, hammering, cold rolling, etc., and not of vibration, which is, by many engineers and others, put down as the cause of crystallization. Mr. Morris' views were vigorously combated, and the discussion, though exceedingly technical, was varied and interesting.

SIMPLE AND COMPOUND STATIONARY ENGINES.

Mr. Walter Meunier has recently made some experiments with different types of stationary engines for the Alsatian Society of Steam Users. The results obtained may be of interest and value to steam users in this country. In the table which follows, the figures for each engine are the averages of five tests.

COMPARATIVE TABLE OF THE PERFORMANCE OF SINGLE AND DOUBLE CYLINDER ENGINES.

COMPOUND ENGINES.

Type of Engine.	Indicated horse power.	Pounds of water hourly per indicated horse power.	Remarks.
Four slide valves	65	16.42	Cranks at 90 deg.
Wheelock	124	16.16	Single tandem.
Four flat s ide valves	251	16.06	Cranks at 90 deg.
Wheelock	304	15.93	Double tandem.
Corliss-Berger	306	16.15	Cranks at 90 deg.
Average	210	16.14	

SINGLE CYLINDER ENGINES.

Corliss-Creusot	150	17.18	
" "	154	17.27	
Corliss-Berger	212	16.99	
Old type Corliss	302	18.26	Double engine.
" " "	256	17.92	" "
Average	215	17.52	

The difference between average consumption of steam in the two types is 17.52—16.14 = 1.38 lbs., or 8.55 per cent. in favor of the compound engines. But the efficiency of the compound engines, as measured by a friction brake, was only 88.15 per cent. of the indicated horse-power, while that of the simple engines was 91.15 per cent., giving a difference in favor of the latter of 3 per cent.; so that the actual economy of the compound engine was 8.55—3 = 5.55 per cent.

Comparing the simple Corliss-Creusot engine with the Wheelock compound, the difference in steam consumption is 17.18—16.16 = 1.02 lbs., or 6.31 per cent. in favor of the compound. Comparing two other engines of recent construction, the simple Corliss Berger with the compound engine having four flat slide-valves, the difference is 16.99—16.06 = 0.93 lbs., or 5.79 per cent. in favor of the compound engine. The average economy of the compound engine, in these two cases, when the indicated horse-power is compared, is 6.05 per cent., or only 6.05—3 = 3.05 per cent., when the effective horse-power is made the basis of comparison.

Some conclusions drawn from these experiments by Mr. Meunier are summarized below.

In each special case all the details must be carefully considered before deciding which type of engine is to be adopted. A calculation should first be made to determine whether the interest on the additional cost of the compound engine is greater than its annual saving in fuel. In the second place, the cost of attendance and supplies is larger for a compound engine than for a simple motor of the same power.

For large power the compound engine is preferable, both on the score of economy and smooth working, when the load is constant. But if the engine is not to develop more than 250 horse-power, Mr. Meunier thinks that the modern simple engine, which has been so much perfected of late, is to be preferred on account of its simplicity.

LITTLE THINGS THAT COUNT.

In every line of business, no matter whether conducted upon a large or small scale, it is the little things that count. The little expenses, the little wastes, the little economies, are the ones that turn the balance of accounts, either for profit or loss, and it is these little things that need the closest attention. The larger, more important details of every business are carefully looked after; there is very little chance for neglect, carelessness or oversight. The workman who spoils a costly piece of machinery, or causes a loss of any considerable account, is held responsible, and is generally very careful in this respect, but in little things he is not as prompt in exercising care and economy, and these little things are looked upon as of no consequence, and as having no real value.

We have heard it asserted by a man who, beginning on barely nothing, succeeded in building up a large and profitable business, and retiring with a considerable fortune. When asked how he had managed, what was the secret of his success, he replied, by saving what other people wasted, looking after the little things and seeing that not a thing was thrown away or cast aside as too small or insignificant to be of any value. A few cents here and a few there make up quite a sum in the course of a year, and it is by paying careful attention to the little details, by looking after the cents, that I have made my dollars.

There is a great deal more in this than most people would be willing to admit. They are in too much of a hurry to make dollars to look out for the cents.

A poor and incompetent or disinterested workman is not only a poor man to employ because he is this, but because he is wasteful and careless about small things. Take some of our very large manuafactories, where hundreds of employes are engaged, and, unless the most watchful care is exercised, the amount of waste that is lost would go far toward paying running expenses.

In these times of close competition, when it becomes an absolute necessity that every possible item be carefully turned to account, the exercise of economy in small things is being more rigidly cultivated. Profits at best are only small, and these are made considerably less by the wastefulness of careless and unthoughtful men.

Nor is it alone in the factory or work-shop where the necessity of looking after these little things makes itself apparant. The workingman of to day, with his wages scarcely sufficient to provide for the comforts and necessities of life, has the most need to practice economy in small things, and it is surprising to note what an amount of waste is made by those who have the most need to practice economy. A few cents here and a few there seem mere trifles, and are not regarded as of any particular consequence, or as having any material relation to the annual expenses, but if a careful account were kept for a single year,the result would be astonishing, and just here is where the difference lies between individuals and corporations. The latter have learned by a comparison of the strict accounts , which are an absolute necessity with them, the lesson of economy in small things. Everything is put down and can be looked over and studied, and its effect upon the total noted, and this is a lesson which should be learned by individuals, and workingmen especipally. By them, as a rule, no account of daily expenses, or even any expense, is kept. They receive their money and it is spent. At the end of the year not one of them can tell where his money has gone, or for what purpose, whether he has made a profit from the time and labor expended or not; and for this reason, as well as that he may see where and how he may economize and save something, even if only a small amount, the workman should keep a strict and careful account of daily expenditures and receipts.

Such a course would not only result beneficially to him personally, but would make him a more careful, painstaking and valuable employe. Carelessness at home or of one's personal interests, breeds carelessness of others' interests, and there is nothing which an employer notices more quickly, and is more willing and ready to appreciate and reward than the displao of care and interest in the little details by a workman.

It cannot be expected that a man who is careless of his own welfare and interests will exercise any more than he is obliged to do under the watchful eye of the foreman or proprietor, or care for those of his employer.

It is, then, all-important that every individual exercise this watchfulness of the small things in business and in private life. The employer must guard himself against loss by the carelessness and wastefulness of his employes. The employe should be equally vigilant in his own personal interests, and all should remember that it is the little things that count.—[Manufacturers' Gazette.

Another Iron Pioneer Gone.

John H. Shoenberger, senior member of the firm of Shoenberger & Co., iron manufacturers of Pittsburgh, died November 13, aged 80 years. The Pittsburgh *Dispatch* says: "When the Shoenbergers transplanted their iron interests from the Juniata to the Alleghany they at once gave their attention to the nail industry, and were properly the pioneers here of this branch of the iron trade. The Shoenberger mill in old Bayardstown was one of the landmarks of that section a half century ago. When the subject of this sketch began active life there were just three iron factories in the city of prominence, his, the Sligo Iron Works, William M. Lyon and the works of Spang, Chalfant & Co., all established about 1824 or 1825. John H. received a collegiate and also a practical business training, and his poise in after life showed how well he had profited thereby. After the death of his father, 1858, he took the active management of the business of J. H. & G. H. Shoenberger. Such had been the title for twenty-six years, the founder, Dr. Peter Shoenberg, having retired in 1832. In 1860 the firm became Shoenberger, Blair & Co., and in 1865 Gen. C. L. Fitzhugh, George Shoenberger, of Cincinnati, John Z. Speer and G. A. Steiner leased the mill and still operate it, though John H. Shoenberger always retained an interest."

Sharpening Knives.

A dealer in cutlery expresses the opinion that not one man in fifty knows how to sharpen a pocket-knife. "A razor," he says, "must be laid flat on the hone, being hollow ground and requiring a fine edge. But a pocket-knife requires a stiff edge, and the moment you lay it flat on a stone, so as to touch the polished side, you ruin the edge.

"The blade must be held at an angle of twenty or twenty-five degrees, and have an edge similar to a chisel. This is technically called the 'camel,' and is marked on all new knives by a fine white line which does not remove or touch the polished surface. Knives improperly whetted are often condemned as too hard or too soft without reason."

Industries, speaking of the Copenhagen Horseshoe Manufacturing Co., says that after several years of experimental work, the concern has at last succeeded in producing machine-made horseshoes, that are said to be equal, and in some respects superior, to good hand-made shoes. The process of manufacture is divided into a series of distinct operations by separate machines, which have been gradually perfected. The shoe is machine-forged, and passes through the entire process in one heat, being still red hot when leaving the last machine in the finished state. The shoe can be made of any shape, size and thickness, and modified in the smallest detail. The firm is now very busy, and cannot keep pace with orders.

THE great novelty of this year's Boston state fair, now being held in that city, is a wonderful canal which occupies the ground floor of the main hall. It is 500 feet in length and 21 in width. On its surface are seen steam launches, small side-wheel steamers of old and new models, canoes, rafts marine bicycles, life-saving apparatus and passenger gondolas, the whole making an interesting and novel display.

THE *Mining and Engineering Journal* says that only two pounds of tin have been discovered in Dakota, yet $2,000,000 of capital has been raised for the purpose of working the mines.

McNEIL'S BALANCED CHARGING BARROWS FOR BLAST FURNACES, FOUNDRIES, &c.

The old styles of charging barrow are open to several objections. The position of the load entirely above the point of support renders them extremely unsteady when in motion. They require considerable skill in working, as a very slight range of motion is allowed the handles before they are liable to get beyond the control of the operator. The position of the box on top of the axle also puts it very high up in the air; consequently small wheels must be used to give ease of filling. The use of these small wheels makes hard pulling, as a large wheel always runs easier than a small one. The unsteady balancing of the load renders it necessary where the pulling is hard to have a second man to help. In dumping, a second man is required to prevent the barrow from falling into the hopper, and frequently a fence to catch the barrow is also necessary. The old pattern of barrow is so clumsy that, considering its defects and clumsiness, it is surprising that some effort for improvement in that direction was not made long ago.

McNeil's patent balanced charging barrow is intended to remedy all the defects enumerated above. It is light as most barrows, easy running, easy to fill, dumps automatically, and can be handled by one man in any situation. The shape of the box is the same as the old style. The box rests on the tops of a U frame by means of gudgeons fastened to its sides and very near its center of gravity. The wheels, attached to the sides of the U frame independent of

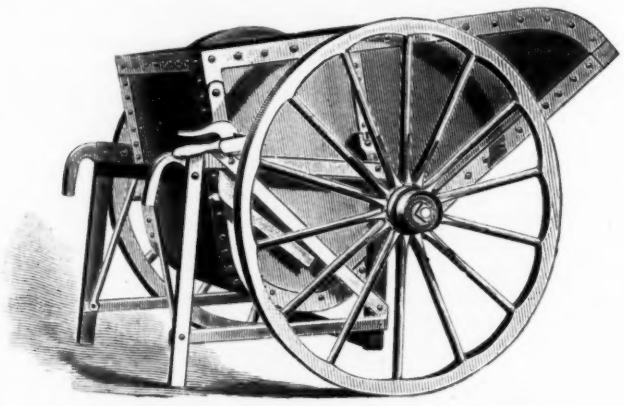


FIG. 1.—McNEIL'S BALANCED CHARGING BARROW.

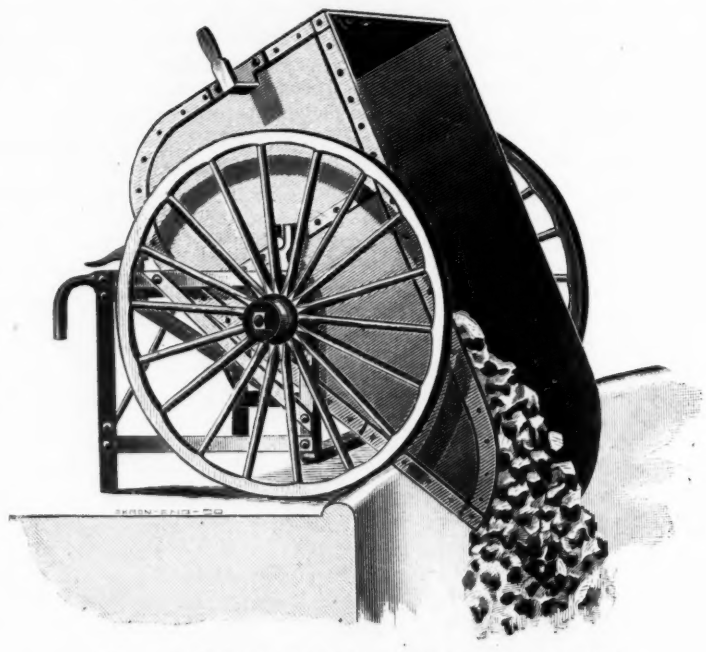


FIG. 2.—McNEIL'S BALANCED CHARGING BARROW.

the box, are large and made of wood. They give easy traction and are quite as durable as any wagon wheel. The back of the box is supported by a handle on one side resting on the handle frame and is attached to the frame by means of a hooked and counter-balanced trigger.

The barrow when loaded is adjusted so that it rests balanced on a point about two inches above the ordinary position of the operator's hands. It leaves the load on the hands just sufficient for a good, safe grip, but not too heavy. When empty the handles are tossed up and the operator takes hold of the ends of the legs and finds it balanced there. The box is balanced independent of the frame. When loaded the box is overbalanced forward, and if free will dump, but is held in position by the handle and trigger, the weight of the handles being enough to keep it in place. When the hopper is reached and it is ready to dump, the operator as he comes to the hopper pulls the trigger with his thumb. The box proceeds to dump the load while the operator drops the handles, turns round, picks them up and starts away. The box, after discharging its load, is overbalanced backward and returns to place of its own weight. The shape of the frame allows the axles to be placed close to the center of the barrow, giving stability while in motion. Any green hand can handle this barrow without danger of spilling, while a spill with the old style is a common occurrence at any furnace. Another advantage is that the U frame puts the box close to the ground, so that only a short lift is necessary in filling.

These barrows have been in use for over a year and are highly praised by the users. They declare that nothing equal to it has been seen heretofore. United States letters patent have been issued on this barrow. It is manufactured by G. C. McNeil, of Akron, O., who is the inventor.

A New Steel Process.

Mr. Depauw, of New Albany, Ind., who is building very extensive steel works, says that his company proposes to manufacture by a new process, by which they can make steel direct from the ore. "The process," says Mr. Depauw, "was the invention of Charles Adams, of Pittsburgh, and he claims for his invention that it lessens the cost, but it does not differ materially from other processes now in use. The reduction is accomplished by gas, which is passed directly through an upright column to the ore, mixed with some carbonaceous material. Then the process is directly from the reducing furnace to the open-hearth, and from that on the operation is similar to the ordinary methods. This process has been tried and proved very satisfactory in an experimental way, but it has never been attempted on a commercial scale. The saving in the cost is effected in the production of the stock for the open-hearth process, as the necessity of a blast furnace is obviated, and it is not necessary to put the ore into what is known as the pig iron condition before it is made into steel."

Our Blast Furnace Capacity.

The *Bulletin* of the American Iron & Steel Association has made an investigation into the number of blast furnaces completed on November 1, 1889, as compared with November 1, 1888, together with the number building at each of those dates. No furnaces are included in the first list which "exist only on paper," or which for any reason should be classified as abandoned. The results are summarized as follows:

Furnaces.	Nov. 1888.	Nov. 1889.
Whole number of completed furnaces	582	575
Anthracite furnaces	200	190
Bituminous coal and coke furnaces	214	233
Charcoal furnaces	168	146
Number of furnaces building	30	29
Annual capacity of completed furnaces, in net tons	10,990,993	13,168,233
Annual capacity of furnaces building, in net tons	1,122,000	1,204,000

The total capacity extant is quite large, larger than is likely to be put into operation continuously.

Chili Admits Machinery Free.

The Department of State at Washington has been officially informed that a law has been enacted by Chili, to take effect four months from August 30, 1889, abolishing import duties on machines and tools for the use of agriculture, mines, trades and industries: pipes or tubes and composed of copper, bronze or iron galvanized or ungalvanized, knees, joints, T's and other such necessary articles; iron or steel wire, galvanized or ungalvanized, up to the number 14 inclusive, and copper wire, or insulating composition for transmission of electric currents; telephonic and telegraphic instruments, insulators, iron and steel posts and other special necessaries for telegraphs and telephones, the material of iron and steel for the permnent way of steam or horse railways and for portable railways; wheels, axles and felloes of iron or steel for railways and the cars for portable railway; iron in plates.

The U. S. Cruiser "Charleston."

The Secretary of the Navy has notified the Union Iron Co., of San Francisco, that he is ready to accept the protected cruiser, "Charleston," at the contract price of $1,017,000, deducting $4,500 for delay in completion, and $33,000 for failure to develop the horse-power required by contract. The builders have asked permission to substitute screws of a finer pitch and make another trial, but have been informed that if they do this they must pay a penalty of $100 a day until the vessel is accepted; and it is probable that the cruiser will be delivered to the Navy Department as originally proposed. While the proposed change of screws would doubtless produce a higher indicated horse-power, it would render the vessel less efficient in service, according to the views of many naval officers.

Annealing Steel.

There are two ways of annealing steel. It can be heated to a dull red heat, covered with dry, warm sand and left to cool slowly, or heat and cover up in the forge fire and leave it there until the fire is out and all is cold. The other method is to heat the steel red hot; heat gradually, let it "soak," as the smith says, until it is evenly heated, then remove from the fire and go to some dark corner. Let the steel cool until you lose sight of the dull red in the dark, then cool off in cold water. A good "dark place" may be made by throwing your coat over a barrel, leaving just room enough to look in at the iron. This method is called the "water anneal," and is based upon the theory that steel softens when cooled at a certain temperature.

IN the metal aluminum it would appear that there would be found ere long a method which will come into general use in machine construction, both electrical and mechanical. Not more than two years ago the price was $10 a pound, but at present it can be bought for $2. In 1883 but 63 pounds of this metal were manufactured in the United States, while in 1885 it was 234 pounds, and will probably reach this year several thousand pounds, as there are now in use several good reducing processes. Thus we see that within a few years there has come rapidly into use a metal which combines marked features of excellence, which cannot fail in the future to be of great value in the arts.—[Modern Light and Heat.

HALL BROS. & CO., of Louisville, Ky., have been appointed sole agents in all markets for the Cherokee iron, of Cedartown, Ga. This phenomenal iron is familiar to the trade for its wonderful superiority.

OUR Government vaults can hold $100,000,000, the largest in the world.

INDUSTRIAL SUMMARY.

New Enterprises:—

It is reported that large machine shops are to be established at Jonesboro, Ark.

The office of the Montour Iron & Steel Co. has been removed from Reading to Danville, Pa.

It is reported that the Calera Land Co. will build a 50-ton charcoal iron furnace at Calera, Ala.

A cutlery factory is to be established at Toledo, O., for the manufacture of the best grades of goods.

The Acme Manufacturing Co., Baltimore, Md., has been incorporated by R. J. C. Jones, E. W. Read, C. W. S. Banks and others.

The Missouri Pacific Railway Co. will, it is reported, build extensive machine shops and a roundhouse at Van Buren, Mo.

The Charleston Development Co., lately incorporated, contemplate erecting a small rolling mill for sheet iron at Charleston, W. Va.

A stock company has, it is reported, been organized to build an iron furnace at Pensacola, Fla., to manufacture Bessemer pig from foreign ores.

The Frisbie Engine & Machine Co., recently chartered with capital stock of $30,000, will operate the Frisbie Machine Works of H. P. Frisbie, at Covington, Ky.

The Pequest furnace, at Oxford, N. J., which has been idle for over two years, has been bought by the Lackawanna Iron & Coal Co., and will be started running soon.

W. J. Hammond & Son, of Pittsburgh, Pa., are to erect a $300,000 rolling mill at Mansfield. It is understood that the puddling department will be erected first, and will be in operation by April 1, 1890.

The Seattle (Wash.) Rolling Mill Co. has been incorporated with $100,000 capital. The incorporators are James Cartwright, William Hainsworth, L. S. J. Hunt, H. E. Holmes, Bailey Gatzert, Jacob Furth, C. H. Noble, R. H. Boyle, A. P. Mitten, W. H. Llewllyn, S. L. Crawford, C. T. Conover and W. C. Hill.

The North Missouri Coal & Iron Co. is about to erect a big Bessemer steel plant near Birmingham, Ala. The principal product will be small blooms and billets, for which class of steel there is a large demand in the South. The works may be extended so that steel rails can be included in the list of products.

Norristown, Pa., is soon to have a new industry which marks an important development in the manufacture of steel products, and may revolutionize railroad car-wheel construction in this country. The Continental Car-Wheel Co. has purchased grounds for its buildings, and will begin the manufacture of rolled street-car wheels.

The latest reported addition to the industries of Jeanette, Pa., is a steel plant to be established there by Eastern capitalists. The location selected is just outside of the town proper, and was selected on account of the proximity of natural gas in the Grapeville belt. It is said that the works, when in operation, will employ at least 700 men, and will be comprised of a steel making and finishing department. In the latter fine tools and machinery of various patterns will be produced.

A dispatch from Chattanooga, Tenn., says that "the East Chattanooga Land Co.'s big deal has been consummated with a New England syndicate for $5,000,000. All the papers have been signed and the money paid. The property consists of 2,000 acres bordering on the city and 1,500 acres of iron-ore lands. The East Tennessee Land Co. has also been organized with $3,000,000 capital, General Clinton B. Fisk, of New York, president. They have bought 300,000 acres in East Tennessee on the line of the Cincinnati & Southern railroad for $2,000,000. The scheme contemplates locks, development of extensive coal and iron fields, the establishment of a Winter and Summer resort, and the building of a central iron city."

The following new companies were granted licenses of incorporation by the Secretary of State of Illinois: Beck & Hartung Steam Wheel Engine Co., to manufacture steam engines; capital, $500,000; incorporators, B. Beck, C. C. L. Hartung, Charles S. Van Duyn.—Duquoin Light, Heat & Power Co., Duquoin, to furnish light, heat and power; capital $50,000; incorporators, J. R. Trusdale, D. Sheppard, R. M. Foster.—Chicago Electrical Belt Co., Chicago, to manufacture electrical belts and appliances; capital, $100,000; incorporators, E. J. Hill, R. W. Hill, W. O. Scott.—Magnetic Fire & Police Alarm Co., Chicago, to engage in manufacturing, operating and dealing in mechanical devices for fire alarms; capital, $500,000; incorporators, Milton Weston, U. W. Weston and R. H. Mason.—Chicago Spring Co., Chicago, to manufacture wagon and carriage springs; capital, $40,000; incorporators, James Plumstead, G. H. Jones and Charles A. Kimbark.—S. E. Brown Heating Co., Chicago, to manufacture heating apparatus of various kinds; capital, $50,000; incorporators, S. E. Brown, Joseph Hutchinson, F. P. Blodgett.

Enlargements, Additions, Removals, Etc:—

The Iowa Rolling Mills, Burlington, Ia., will be rebuilt, the new buildings being materially larger than the old ones.

The Missouri Malleable Iron Co., St. Louis, are making a number of improvements in their plant, with a view to enlarged capacity.

It is reported that the Columbus Architectural Iron Works, of Columbus, O., are considering the removal of their works to Little Rock, Ark.

The Long & Allstatter Co., Hamilton, O., are adding a story to their main building. The building is 60x200, and the improvement will make it four stories high.

The National Screw & Tack Co., organized last May at Cleveland, with a capital stock of $150,000, are erecting additional works at a cost of $30,000 for buildings alone.

The Norton Emery Wheel Co., Worcester, Mass., have broken ground for an addition to their large works, situated just out of the city of Worcester. The addition is to be 48x48 feet, in addition to their present works, which are 118x48 feet.

The Eagle Iron Works, St. Louis, Mo., are enlarging their plant. The works have been equipped throughout with electric lights, in order to admit of night running.

A stock company has purchased the rolling mill of the Central Iron Works, Helena, Ala., and will improve and put it in operation, as lately mentioned. Ten new double-heating furnaces will be erected.

The Brierfield (Ala.) Coal & Iron Co., which failed some two years ago, has been reorganized. The new company will issue $700,000 of preferred stock, and $500,000 of 6 per cent. bonds, and with the money realized will not only put the old works in operation again, but will build new plants.

Sealed proposals will be received at the office of the Superintendent of the Postoffice, Court House, etc., building at Baltimore, Md., until 2 o'clock P. M on the 30th day of November, 1889, for all the labor and materials required to put in place, complete, wood-front drawers in Postoffice, screen, three new elevator doors in sub-basement, change the delivery windows and put in place the metal front newspaper boxes, in the above-named building.

The Pittsburgh Bridge Works are running full on double turn, and are contemplating making some extensive improvements. In the Spring they will erect a two story building, 50x200 feet, for machine shop and pattern shop. Originally these works occupied about one acre of ground, but they have gradually spread out until now they cover three and one-half acres. The principal work on which they are at present engaged is the replacing of bridges in in the Conemaugh Valley.

The Illinois Steel Co. is preparing, we hear, to make extensive additions to its plant at South Chicago, where work has been begun on the foundations of two blast furnaces. A plate mill and open-hearth furnaces are also among the anticipated structures at that point; but some time must elapse before all will be ready for operation. At Joliet the company is now pushing to completion a blast furnace, which will be ready to blow in early next Spring. When these extensions are completed the company, it is expected, will be entirely self-supporting in pig iron and in spiegeleisen.—[Chicago Journal of Commerce.

Fires and Accidents:—

The foundry and machine shop, saw mill, etc., of Luke Bros., Lockville, N. C.; loss $6,000.

The Norwegian Plow Co.'s works at Dubuque, Ia., were burned last week. Loss, $40,000; insured.

The Hood & Murray Machine Co.'s shop, St. Louis, was badly damaged by a fire November 3. About $3,000 worth of new shop tools were virtually destroyed, besides quite an amount of work on hand.

A fire destroyed the boiler house of the Muncie Nail & Iron Co., at Muncie, Ind., at 1 o'clock, A. M., November, 9th. The origin of the fire is unknown. Mr. Jas. F. Darnell gave the order for lumber at 3 o'clock the same morning, and expects to be running again in two or three days.

General Industrial Notes:—

It is reported that Cleveland capitalists have bought a controlling interest in the stock of the Stewart Iron Co.'s plant, at Sharon, Pa.

The plant of the Wheeling Steel Works, at Benwood, W. Va., is being operated to its utmost capacity. For the week ending October 26, the output was 2,200 tons of steel.

Messrs. E. & B. Holmes, Buffalo, N. Y., manufacturers of high grade woodworking machinery, were awarded six medals on machinery recently exhibited by them at the Piedmont Exposition, Atlanta, Ga.

The Stillwell & Bierce Manufacturing Co., Dayton, O., have been awarded by the Acadimie Nationale, of France, its grand gold medal for its Victor turbine, now on exhibition at the Paris Exposition.

During the month of October the output at the armor-plate mill of Carnegie, Phipps & Co., Homestead, Pa., was over 4,000 tons. This is conceded to be more than the output of all the plate mills in the Pittsburgh district combined.

The contract for furnishing the electric towers, for Allegheny, was closed Wednesday, between the Westinghouse Electric Co. and the Star Iron Tower Co., of Fort Wayne, Ind. The contract calls for the completion of all the material in 90 days.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 5th day of December 1889, for the erection and completion of two roofs at mailing platforms for the U. S. Custom House and sub-treasury building at Chicago, Ill.

A carload of steel railroad ties for the Chicago & Western Indiana Railroad was shipped recently from Carnegie's Homestead works. These are the first steel ties manufactured in this country. The Chicago & Western Indiana Road has practically decided to adopt these ties.—[Chicago Journal of Commerce.

The by-law which provides for the granting of a bonus to the Belleville Rolling Mills Co., Belleville, Ont., and which will be submitted to the vote of the ratepayers on the 20th of November, provides that a company shall be formed with a capital of at least $50,000, for the establishment of a rolling mill for the manufacture of bar and other kinds of iron or steel in Belleville. Upon the erection and completion of buildings and plant, at a cost of not less than $40,000, with a capacity of sixty tons per day, and the employment of at least eighty men in and about the works, the sum of $12,000 shall be paid as a bonus, and the sum of $2,600 per annum for the next five years, provided the number of men is increased to 250 by the end of that time, the increase to be not less than twenty per annum. The men shall all reside in Belleville, and shall be employed for not less than ten months in each year. The works and plant shall be exempted from taxation for ten years, shall not be removed before the expiration of that period, and shall be operated continuously except in event of circumstances arising which the company cannot control. —[Canadian Manufacturer.

BURNING OF FURNACE PLATES.

M. Hirsh has, during the past few months, been engaged in making experiments on the causes of the burning of the furnace plates of boilers, and finds that in many cases the introduction of oil into the boiler is decidedly dangerous. In making the experiments the inside of the boiler was painted with oil, and then filled and heated in the usual way. With certain oils it was found that the plates became much hotter than when water was directly in contact with them, and this difference of temperature increased as the fire was pushed, reaching 50° C. when the rate of evaporation was 31 lbs. of water per square foot per hour, and 200° C. when this rate was raised to 51 lbs. of water. In one instance, when the rate was not more than 35 lbs. of water per square foot of grate area, the temperature of the plate was found to be higher than 450° C., the melting point of zinc. To investigate the subject more fully, a tin flask was coated with oil in the way described above, and filled with water. On heating this, it was found that with certain oils the tin could be raised to a red heat even when exposed to but a moderate-sized flame. Of the different oils, linseed is the worst, but colza runs it close. Naphtha does not occasion overheating unless it decomposes, which it is very liable to do if the heating is too rapid. Valvoline only occasions burning under excessive rates of evaporation. In general, oils that are readily decomposed by heat were found to be especially dangerous, whilst mineral oils are comparatively safe.—[English Paper.

Ecrasite.

The new explosive, ecrasite, is the invention of two engineers named Siersch and Kubin. This explosive is impervious to damp, shock, or fire. Its power is to dynamite as 100 to 70, and it can be carried from place to place with the utmost safety. It is not smokeless, but emits a thick black smoke, and the detonating noise is louder than that of gunpowder, but shorter, sharper, and clearer. It can be used for rifle cartridges or as priming for a cannon, and a bomb-shell loaded with it explodes with such terrific results that experiments against palisades representing 100, 250 and 500 men at ranges of 300, 750 and 1,200 metres recorded marks on every division of the palisade standing for a soldier. The secret of this invention is being closely kept for the Austro-Hungarian War Office.

Railway Reading Lamp.

The South Eastern Railway, in England—the very same S. E. R. of which Dickens complains in one of his "Uncommercial" sketches, for its encroachments upon the play-ground of his boyhood—has adopted the "put-a-penny-in-the-slot" device for the purpose of making its passengers pay for a sufficient light for reading, if they happen to want it. The apparatus is situated immediately over the passengers' head, and under the rack, and is contained in a small box five inches by three inches. The light is of five-candle power, and is obtained by the introduction of a penny at the top of the box, and by the subsequent pressure of a knob, and will last for half an hour, extinguishing itself at the end of that time automatically.—[Mechanical News.

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THE MOST DESIRABLE LOCATIONS IN THE SOUTH for manufacturing wagons, stoves, agricultural implements, furniture, or for foundries, machine shops, rolling mills, muck bar mills, nail works, glass works, cotton or woolen mills, and tanneries, are to be FOUND IN VIRGINIA along the line of the Norfolk & Western Railroad from Norfolk to Bristol and upon its branch lines. HARD WOOD OF EVERY VARIETY; PIG IRON from the furnaces at Lynchburg (2), Roanoke (2 in operation and 1 now under construction), Pulaski (1), Ivanhoe (1), Radford(1 to be built in 1890), Salem, Graham and Max Meadows (1 at each point now under construction); BAR IRON from the rolling mills at Roanoke and Lynchburg; COKE AND SEMI-BITUMINOUS COAL **from the Pocahontas Flat Top Field**; SUPERIOR GAS COALS from mines on the Clinch Valley extension; GLASS SAND from Tazewell Co.; COTTON FROM THE MARKETS of the Southern States, and Wool from all the Western and Southwestern States and Territories, at advantageous freight rates. FAVORABLE FREIGHT RATES made upon raw materials to all factories established upon its line, as well as to points in the United States and Territories, upon the manufactured articles.

Those seeking new fields for manufacturing establishments should not fail to investigate **the wonderful development in Iron, Coal and Coke Industries that has been made within the past five years along the line of the Norfolk & Western Railroad, and the advantages offered by the State of Virginia in the supply of cheap raw materials, by the Norfolk & Western Railroad** in the matter of freight facilities and rates upon raw materials and for reaching home, far distant and foreign markets, and by the cities and towns along its line in the way of advantageous sites, at moderate cost. Many of the cities and towns exempt manufacturing establishments from taxation for a series of years.

For further information as to freight rates and sources of supply of raw materials, apply to A. POPE, General Freight Agent, Roanoke, Va., or to

CHAS. C. EDDY,

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ROANOKE, VA.

Natural Gas Solidified.

A process of condensing natural gas has been invented and patented in Anderson, Ind., and is attracting widespread attention. The great possibilities of it have attracted the attention of the Standard Oil Co., and representatives of that corporation from Cleveland and New York have made the inventor flattering propositions should the plan prove a success. The inventor states that there can be no doubt as to the possibility of his process. He is now engaged in the construction of the necessary apparatus, and will shortly give a practical exhibition by reducing a quantity of natural gas into solid substance. The process itself, as well as the machinery needed to carry it out, is very simple. Gas, when transformed into solid matter, is not dangerous to handle. Its expansive force is very great, and when the substance becomes heated above a certain degree it will become very volatile and will burst an ordinary cask or can, but the effect is gradual and it does not explode. The inventor claims that with a 10 horse-power engine he can reduce enough gas in one day to supply a city of 50,000 inhabitants with fuel for 24 hours.

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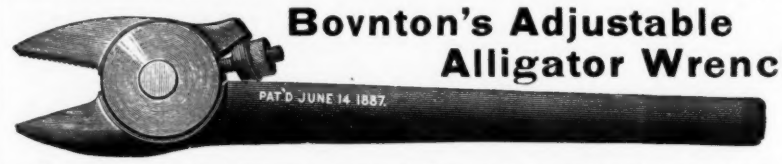

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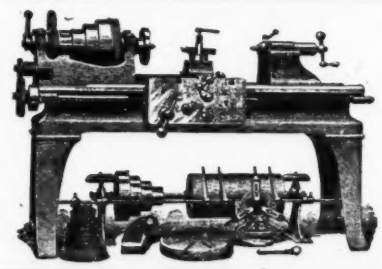

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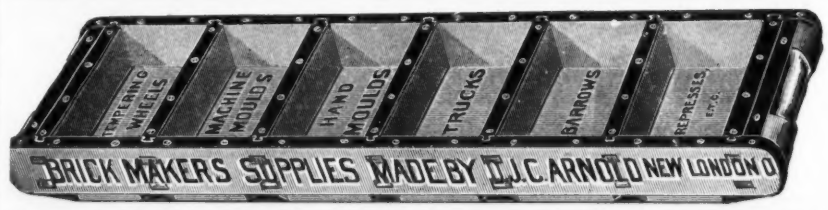

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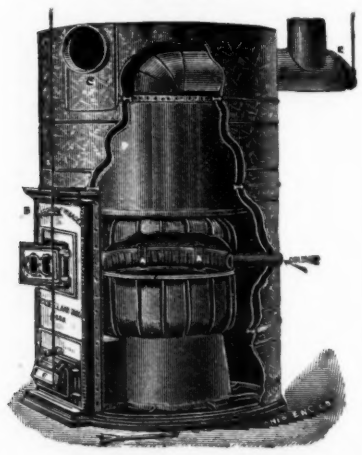

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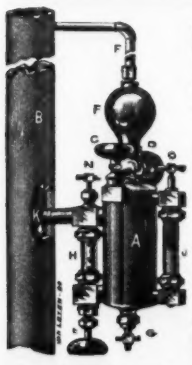

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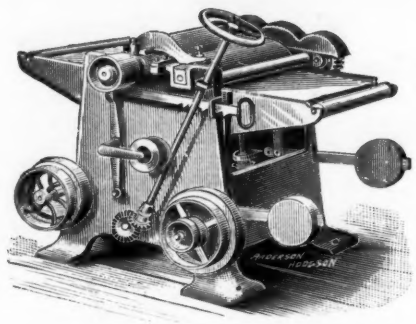

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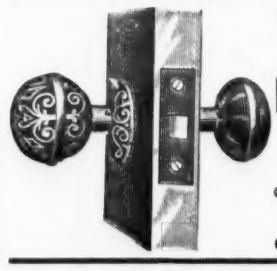

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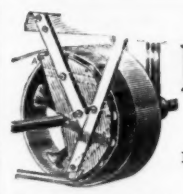

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CHICAGO (reported by Rogers, Brown & Co.): Southern Coke No. 1 Foundry, $18 50@19 00; Southern Coke No. 2 Foundry, $18 00@18 50; Southern Coke No. 3 Foundry, $00 00@00 00; Southern Coke No 1 Soft, $ 8 00@ 8 50; Southern Coke No. 2 Soft, $17 50@18 00; Southern Grey Forge, $00 00@00 00; Ohio Silveries No. 1, $18 75@19 25; Ohio Silveries No. 2, $17 75@18 25; Ohio Strong Softeners No. 1, $19 25@19 75; Ohio Strong Softeners No. 2, $18 25@18 75; Lake Superior Charcoal Nos. 1 to 6, $20 50@21 50; Tennessee Charcoal No. 1, $19 50@20 00; Tennessee Charcoal No. 2, $ 8 50@19 00; Southern Standard Car Wheel, $24 00@25 00; Tennessee Standard Car Wheel, $19 00@20 00; Hanging Rock Standard Car Wheel Cold Blast, $26 00@28 00; Hanging Rock Standard Car Wheel Warm Blast, $22 00@24 00.

CINCINNATI (reported by Rogers, Brown & Co.): HOT BLAST FOUNDRY—Ohio and Southern Coke No. 1, $17 00@17 50; Ohio and Southern Coke No. 2, $16 50@17 00; Ohio and Southern Coke No. 3, $16 00@16 50; Ohio Soft Stone Coal No. 1, $17 50@18 00; Onio Soft Stone Coal No. 2, $16 50@17 00; Hanging Rock Charcoal No. 1, $21 00@22 00; Hanging Rock Charcoal No. 2, $19 00@21 50; Tennessee and Alabamba Charcoal No. 1, $18 50@19 00; Tennessee and Alabama Charcoal No. 2, $17 00@18 00. FORGE—Strong Neutral Coke, $15 75@16 00; Mottled Neutral Coke, $15 00@00 00; Cold Short Coke, $15 50@00 00. CAR WHEEL AND MALLEABLE—Southern Car Wheel, $23 00@24 00; Hanging Rock Cold Blast, $22 00@25 00; Lake Superior Malleable and Car Wheel, $21 00@22 00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry (new classification), $17 00@17 50; Southern Coke No. 2 Foundry (new classification), $16 50@17 00; Southern Coke No. 3 Foundry (new classification), $16 00@16 50; Grey Forge, $15 50@16 00; White and Mottled, different grades, $14 25@15 25; Silver Grey, different grades, $15 00@16 00; Southern Charcoal No. 1 Foundry, $17 50@18 00; Southern Charcoal No. 1 Mill, $16 00@16 50; Southern Car Wheel, Standard brands, $23 00@24 00; Southern Car Wheel, other brands, $18 75@21 25; Hanging Rock Coke No. 1 Foundry, $17 50@18 00; Hanging Rock Charcoal No. 1 Foundry, $21 50@22 00; Hanging Rock Cold Blast, $23 50@25 50; Hanging Rock Warm Blast, $00 00@00 00.

LOUISVILLE (reported by Hall Bros. & Co.): HOT BLAST FOUNDRY—Southern coke No. 1, $16 00@16 50; Southern coke No. 2, $15 50@15 75; Southern coke No. 3, $15 25@15 50; Mahoning Valley (Lake ore mixtures), $19 00@19 50; Southern charcoal, No. 1, $18 00@18 50; Southern charcoal, No 2, $17 50@18 00; Missouri charcoal, No. 1, $19 00@19 50; Missouri charcoal, No. 2, $18 50@1) 00 FORGE—Neutral coke, $15 00@15 25; Cold short, $15 00@15 25; Mottled, $14 00@14 50. CAR WHEEL AND MALLEABLE—Southern (standard brands), $23 00@23 75; Southern (other brands), $19 00@19 50; Lake Superior, $22 00@22 50.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $00 00@19 00; Southern Coke No. 2, $00 00@18 50; Southern Coke No. 3, $00 00@18 00; Southern Grey Forge, $00 00@17 50; Southern Charcoal No. 1, $18 50@19 00; Southern Charcoal No. 2, $17 50@18 00; Missouri Charcoal No. 1, $18 50@19 00; Missouri Charcoal No. 2, $17 50@18 00; Ohio Softeners, $19 00@20 00. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $22 00@23 00; Southern, $19 00@24 00. CONNELLSVILLE COKE—East St. Louis, $5 25; St. Louis, $5 40.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $19 00@00 00; Mahoning and Shenango Valley strong, No. 2 Foundry, $18 00@00 00; Niagara No. 1, $19 00@00 00; Niagara No. 2, $18 00@00 00; Niagara No. 3, $17 25@00 00; Ohio Softener No. 1, $19 25@20 00; Ohio Sofener No. 2, $18 25@00 00; Lake Superior Charcoal, $21 00@00 00; Tennessee Charcoal, $19 50@20 00; Southern Softener No. 1, $18 25@00 00; Southern Softener No. 2, $17 50@00 00; Alabama Car Wheel, $25 00@25 25; Hanging Rock Charcoal, $24 00@00 00.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $21 00@21 50; Lake Superior Charcoal, Bessemer, $21 00@22 00; Lake Superior Coke, Bessemer, $22 50@22 75; Lake Superior Coke, all Ore, $20 00@21 00; Lake Superior Coke, Cinder Mixed, $18 25@18 75; Standard Ohio Black Band, $20 00@21 00; Southern No. 1, $18 25@18 50; Southern Gray Forge, $16 25@16 50; Southern Silvery, $16 50@17 00; Jackson County (Ohio) Silvery, $19 25@19 75; Old Wheels, $19 00@19 75; Old Iron Rails, 25 00@25 50.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $18 50@18 75; No. 2 Foundry, $17 50@17 75; Grey Forge, $16 75@17 00; White and Mottled, $15 50@15 75; Warm Blast Charcoal, $18 00@22 00; Cold Blast Charcoal, $24 00@28 00; Bessemer, $20 00@21 00.

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Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 80
4¼ to 6 by ⅜ to 1 inch	1 90
1¾ to 6 by 1⅛ to 2 inch	2 20
1¼ & 1⅜ by ⅜ to ¾ inch	1 90
1 & 1⅛ by ⅜ to ¾ inch	1 90
⅝, ¾ and ⅞ by ⅜ to ⅝ inch	2 30

Round and Square.

1 to 1⅞ inch	1 80
2 to 2⅝ inch	2 00
2¼ to 3¼ inch	2 30
3⅜ to 4 inch	2 80
4¼ to 4½ inch	3 30
4¾ to 5 inch	3 50

Oval.

⅞ to 1¼ inch	2 20
⅝ to ¾ inch	2 40
½	2 60
⅜	3 00

Half Oval and Half Round.

1½ to 3 inch	2 90
⅞ to 1¼ inch	2 50
⅝ to ¾ inch	3 00
½	3 30
⅜	4 80

Heavy Band.

1½ to 6 by ¼ and 5-16 inch	2 00
to 1⅜ by ¼ and 5-16 inch	2 10
¼ to ⅞ by ¼ and 5-16 inch	2 30
½ to ⅝ by ¼ and 5-16 inch	2 80

Hoops.

1¼ to 4, Nos. 13 to 15	2 65
1¼ to 2, Nos. 16 to 18	2 75
1¼ to 2, No. 19	2 85
1¼ to 2, No. 20	2 95
1¼ to 2, No. 21	3 05
1¼ to 2, No. 22	3 15
15-16, 1 and 1⅛, Nos. 13 to 15	2 85
15-16, 1 and 1⅛, Nos. 16 to 18	2 95
15-16, 1 and 1⅛, Nos. 19 and 20	3 05
15-16, 1 and 1⅛, No. 21	3 15
15-16, 1 and 1⅛, No. 22	3 35
⅞, Nos. 13 to 15	2 05
⅞, Nos. 16 to 18	2 15
⅞, Nos. 19 and 20	2 25
⅞, No. 21	3 35
⅞, No. 22	3 45
13-16, Nos. 13 to 15	3 25
13-16, Nos. 16 to 18	3 35
13-16, Nos. 19 and 20	3 45
13-16, No. 21	3 55
13-16, No. 22	3 65
¾, Nos. 13 to 15	3 35
¾, Nos. 16 to 18	3 45
¾, Nos. 19 and 20	3 55
¾, No. 21	3 65
¾, No. 22	3 75
11-16, Nos. 13 to 15	3 55
11-16, Nos. 16 to 18	3 65
11-16, Nos. 19 and 20	3 75
11-16, No. 21	3 85
11-16, No. 22	3 95
⅝, Nos. 13 to 15	4 05
⅝, Nos 16 to 18	3 85
⅝, Nos. 19 and 20	4 05
⅝, No. 21	4 15
⅝, No. 22	4 25
⅝, No. 23	4 35

Light Band.

1½ to 6 by ⅛ to 3-16 in	2 25
1½ to 6 by Nos. 11 and 12	2 35
1 to 1⅜ by ⅛ to 3-16 in	2 35
1 to 1⅜ by Nos. 11 and 12	2 45
⅞ and 13-16 by ⅛ to 3-16 in	2 65
⅞ and 13-16 by Nos. 11 and 12	2 75
¾ and 11-16 by ⅛ to 3-16 in	2 95
¾ and 11-16 by Nos. 11 and 12	3 05
⅝ and 9-16 by ⅛ to 3-16 in.	3 25
⅝ and 9-16 by Nos. 11 and 12	3 30
½ by ⅜ to 3-16 in	3 50
½ by Nos. 11 and 12	3 60

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	2 75
⅞ inch, " " " 13 and 14	3 05
¾ inch, " " " 11 and 12	3 05
¼ inch, " " " 13 and 14	3 25

Sheet Iron.

No. 10 to 14	2 60
No. 15 to 17	2 80
No. 18 to 21	2 90
No. 22 to 24	3 00
No. 25 to 26	3 10
No. 27	3 20
No. 28	3 40

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 40
C No. 1, " "	2 65
C H No. 1 " "	2 90
C H Flange, " "	3 60
Extra Flange, "	4 00
Solid Fire Box, "	4 90

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 65
Shell	3 05
Flange	3 30
Marine Flange	3 80
Fire Box	4 45

Above includes plates 90 inches wide.

90 to 96 in. wide	½c ℔ extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1½c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ℔s
1 to 2 in. inclusive	09
9-16 to ½ in "	09
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3⅛ to 4 in	11
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⅛ to 6 in	11½
¼ to 9-32 and 6⅛ to 7 in	12
3-6 in	14

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2 to 9-16 wide by 2 to ⅝ thick	0

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Machinery base price,	02¾
Tire "	02¾
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Sleigh Shoe "	02¾
Toe Calk "	03
Cutter Shoes, tapered and burr. "	03

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	4 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	4 00

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Wrought turning (free from cast)	13 00
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Uncut wrought iron boilers	12 00
Steel boiler plates	13 00
Grate Bars	8 50
Pipes and flues (Clean)	12 75
Tank iron	12 50
Hoop and band iron	9 50
Sheet iron	8 00
Wrought drillings	11 00
Malleable iron	9 50
	GROSS TONS
Old iron T rails	24 00
Old steel rails	18 00
Old car wheels	17 00
Old copper	⅜ ℔ 10
No. 1 H. red Brass	11
Heavy yellow brass	8½
Light yellow brass	6
Scrap Zinc	
Tea Lead	
Heavy Lead	3¼

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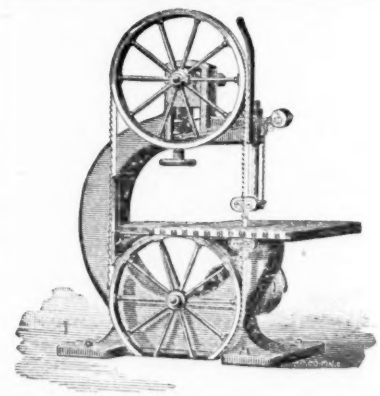

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$100 will buy our new No. 2 band saw.

$185 will buy our new patent band re-sawing machine.

$100 will buy the best No. 1 automatic rip-sawing machine. Weatherboarding attachment included, and one 12-inch rip saw.

$125 our new No. 2 complete as above.

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MACHINERY SUPPLY MARKET.

Anvils.

American.....₩ lb 9@10
Wrights.....₩ lb 9¼

Bellows.

Blacksmiths' { Hill's.....dis 40 / Bullock's....dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70@70& 5
" " " extra.....dis 60&5@60&10
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard.dis 60&10
Shultz Raw Hide Leather Belting, single, ...dis 35&5
Shultz Raw Hide Leather Belting, double, and Light Double.....dis 35&5
Standard, oak tanned.....dis 55@60
Alexander Brothers' pure oak tanned. ...dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.,.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 9¼@10¼

Chalk.

White .....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers. .....dis 25
" Drill.....dis 35
Wescott's Scroll Combination.....dis 30
" Independent.....dis 40
" Little Grant Drill.....dis 30
Horton's Universal & Ind.....dis 40
National Combination.....dis 40
Sweetland " .....dis 40
Skinner " .....dis 40
" Independent.....dis 40
Almond Drill.....dis 25
Morse " .....dis 15
Skinner " .....dis 30

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" " Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Stocks.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1½".....dis 50&10
Morse Taper and Straight shank Larger than 1½".....dis 25
Drill Sockets.....dis 25
Standard.....dis 50&10
Cleveland.....dis 50&10
Maneer's bench.....dis 50&25
Maneer's post.....dis 50&10

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4¼c	5¼c		2¾c
¼ kegs ₩ lb	4½c	5½c		3 c
10 lb cans, 10 in case	6 c	6½c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 40@46
H. H. Barton.....dis 40@46

Emery Wheels.

Detroit.....dis 50@60
Norton's.....dis 55@60
Grant.....dis 55@60
Union Stone.....dis 60
Sterling.....dis 60
Vulcanite.....dis 15@20
Celluloid.....dis 10
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 65@70
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¼	3½
Hexagon	15½	11½	8½	6	5¼	5¼	5
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ₩ lb add ¼c., 1 lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate
{ Car lots.....$2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 70
Sheet Rubber.....₩ lb 12@24
Excelsior Rubber.....₩ lb 48

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 45

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ½ inch and over.....₩ lb 15¼
Sisal, ½ inch and over .....₩ lb 13¼

Sand Paper.

B. A. & Co.....dis 40@40&10
H. H. Barton's.....dis 40@40&10
New England Flint.....dis 40@40&10
Barton's Garnet.....dis 25

Saws.

Disston's Circular.....dis 45
" Band.....dis 20
" Scroll .....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 20
Atkins' Cicular Saws.....dis 50
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 32c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay .....dis 45

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron.....dis 50
Round head iron.....dis 40
Flat head brass.....dis 45
Round head brass.....dis 35
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 55
Machine, round head, iron.....dis 50
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ½ lb Balls		21c@29c
No. 18 " " ¼ and ½ "		18c@28c
No. 36 " " ¼ and ½ "		16c@27c
2-Ply Hemp, ¼ & ½ lb Balls (Spring Twine)		11½c
3-Ply " 1 lb Balls		12@12¼c
3-Ply " 1½ lb Balls		11@11¼c
Cotton Wrapping, 5 Balls to lb		15@16c

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 10@15
Howard.....dis 30
Maneer's machinist.....dis 50&10

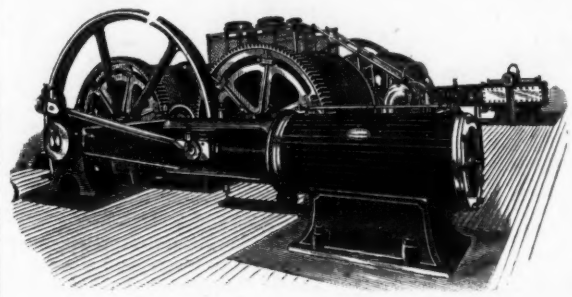
Wire.

New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....$6.00@lb dis 30

Wrenches.

Coe's genuine, cash in ten days.....dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 3
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 10
William's " " .....dis 10
Alligator " " .....dis 40



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Improved Band Friction Hoisting Machinery, Geared or Direct Acting, for round or flat rope.

Wire Rope Haulage Machinery,

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CORNISH { PLUNGER AND BUCKET LIFT PUMPS.

Automatic or Slide Valve Steam Engines, Sheaves, Cages, Buckets, Etc.

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Lubricator for Traction, Portable and all other small engines, pumps, &c. Single Connection.

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LUBRICATORS.

Indorsed by Leading Engine Builders.

Manufactured under strong patents, the validity of which is acknowledged.

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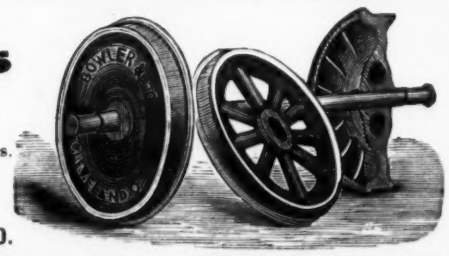

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FROM 1-4 TO 15,000 LBS. WEIGHT.

True to pattern, sound, solid, free from blow-holes and of unequaled strength.
Stronger and more durable than iron forgings in any position, or for any service whatever.
60,000 CRANK SHAFTS and 50,000 GEAR WHEELS of this steel now running prove this.
Crossheads, Rockers, Piston-Heads, etc., for Locomotives. STEEL CASTINGS of every description.
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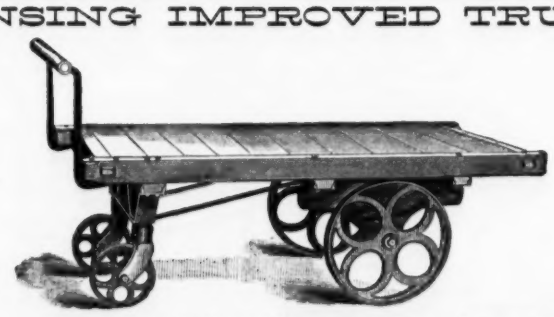

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Write for Catalogue of Iron, Steel and Wood Barrows and all styles of Trucks.

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Augers and Bits.

ommon augers and bits.....dis 70
nell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ₩ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ₩ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $2 75@3 25
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....₩dox. $6 25@6 75
Others.....₩doz. $5 75@6 00
Full polished.....$8 25

Bolts.

Cast iron barrel bolts.....dis 70@70&10
Cast iron shutter bolts, etc.....dis 70@70&10
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70@70&10
Wrought iron square bolts.....dis 70@70&10
Wrought shutter bolts.....dis 60&10

Sargent's list

Carriage, common, new list.....dis 75&7½
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 62½
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 80
Cast brass, loose joint.....dis 33⅓&10
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60&5
Fast joint, broad.....dis 55&10&5@60&10
Loose joint.....dis 70&10@75
Loose joint, jap.....dis 70&10@75
Loose joint, jap. with acorns.....dis 70&10@75
Loose pin, acorns.....dis 70&10@75
Loose pin, japanned acorns.....dis 70&10@75
Loose pin, acorns, jap. plated tips..dis 70&10@75
Wrought steel—
Wrought, fast joint, narrow.....dis 70&10@75
Wrought, fast joint, broad.....dis 70&10@75
Wrought, loose joint, broad.....dis 70&10@75
Table Butts, back flaps, etc.....dis 70&10@75
Regular inside blind.....dis 70&10@75
Light inside blind.....dis 70&10@75
Loose pin.....dis 70&10@75
Light loose pin.....dis 70&10@75

Chains.

Trace, 6½-10-2.....₩ pair 1.03
Trace, 6½-10-3.....₩ pair .92 } 50&10@50&10&5
Trace, 7-10-2.....₩ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887..dis 50&10&5@60
Galvanized Pump Chain.....₩ 5½@6
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 70@70&5

Chisels.

Socket Framing and Firmer.....dis 75&5@75&10
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....₩ gross $12, dis 25@25&5

Gangers.

Barn door, old patterns.....dis 10&10@70
Climax, (Anti-Friction).....dis 70
Star.....dis 40&10@40&10&5
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

	No. 10	9	8	7	6	
Ausable, ₩ lb.	23	24	25	26	28.	dis 25&10@25&10&10
Putnam, ₩ lb.	18	19	20	21	23.	dis 15
Essex						dis 25&10@25&10&10

Horse Shoes.

Burden, at factory.....₩ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....₩ keg $4 00
Mule Shoes, at factory.....₩ keg $5 00

Knobs.

Carriage, japanned.....₩ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hemacite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbear, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60
Escutcheons and keys.....dis 60
Padlocks and padlock keys.....dis 66⅔
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 66⅔
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓

Plumbs and Levels.

Standard list.....dis 70&10@70&10&10
Pocket levels.....dis 70&10@70&10&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@00
Pitcher spout, best makers dis 60&10@60&10&10
Pitcher spout, cheaper goods dis 70&5@70&10&5

Pokes, Animal.

Bishop's I. X. L.....₩ doz $6 50
Bishop's O K.....₩ doz $5 50
Bishop's Pioneer.....₩ doz $3 75
Bishop's American.....₩ doz $3 00

Rakes.

Cast steel.....dis 65
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@4...dis 10
Rifle razor.....dis $9 50 net

Scales.

Hatch, Counter, No. 171.....₩ doz $21 00
Hatch, Tea, No. 161.....₩ dox $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....₩ doz $18 dis 25

Squares.

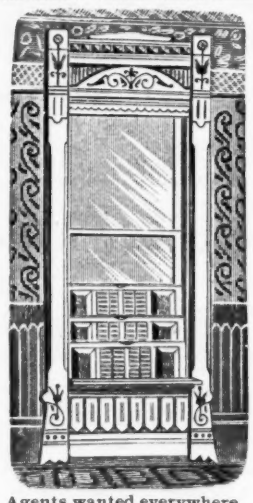
Steel and iron } dis 75&10@80
Nickel plated }
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, January 2, 1888.

American iron carpet tacks all kinds.....dis 80@80&5
Steel carpet tacks all kinds.....dis 80@80&5
Swedes iron carpet tacks, all kinds.....dis 80@80&5
Swedes iron tacks.....dis 75&5@75&10
Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
Tinned Swedes iron tacks..dis 75&10@75&10&5
Tinned Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
American iron cut tacks.....dis 75@75&10
Copper tacks.....dis 50&10
Copper finishing and trunk nails.....dis 50&10
Cigar box nails.....dis 50&10@50&10&5
Finishing nails.....dis 70&10@70&10&10
Hungarian nails and miners' tacks.....dis 70&10@70&10&10
Gimp and lace tacks.....dis 75&10@75&10&5
" " " tinned.dis 75&10@75&10&5
Trunk and clout nails.....dis 70&10@70&10&10
Tinned trunk&clout nails.dis 70&10@70&10&10
Basket nails.....dis 70&10@70&10&10
Chair nails.....dis 70&10@70&10&10
Common and patent brads.dis 70&10@70&10&10
Tinned capped trunk n'ls..dis 70&10@70&10&10

Hartman's Patent Inside Sliding Window Blind



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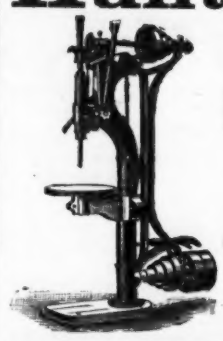

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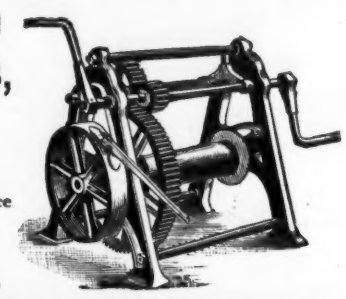

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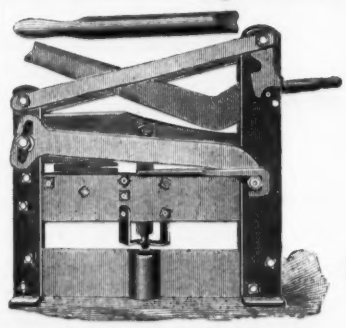

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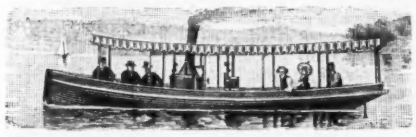

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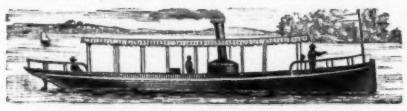

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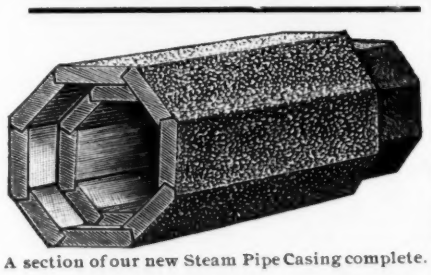

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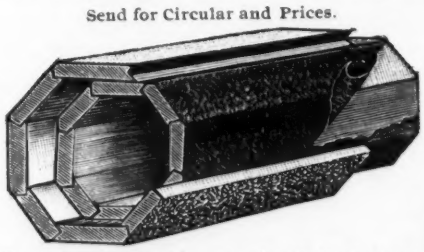

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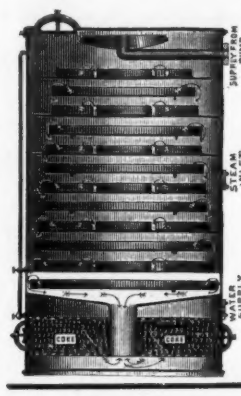

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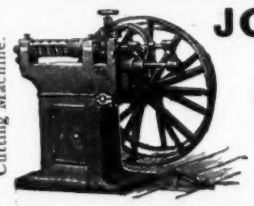

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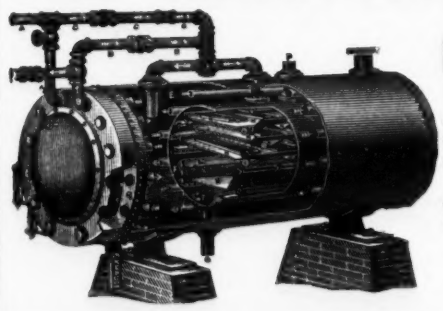

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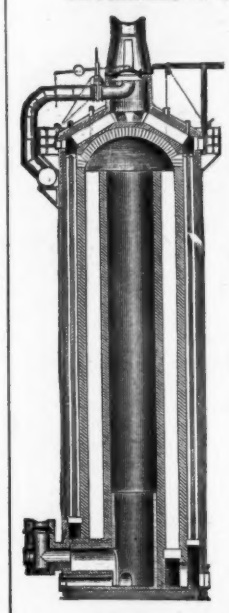

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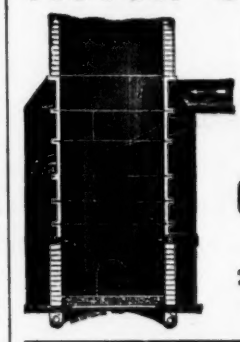

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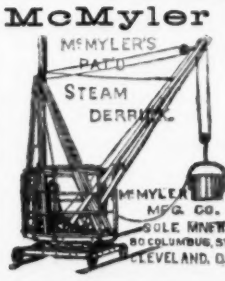

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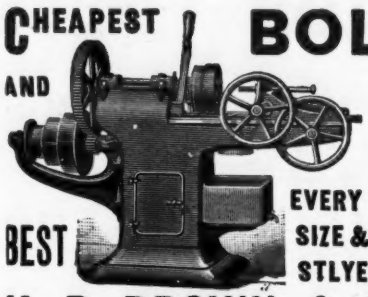

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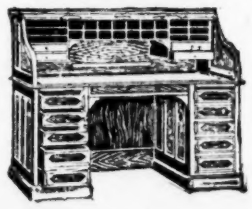

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Standard Time.

Revised March 6th, 1888.

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Eastward.	Arrive.	Depart.
Buffalo Passenger	10 40 a m	10 45 a m
Chicago Passenger	9 20 p m	.....
Local Freight	4 30 p m	.....
Westward.	**Arrive.**	**Depart.**
Chicago Passenger	.....	6.30 a m
Fostoria Passenger	5 06 p m	5 11 p m
Local Freight	1 00 p m	.....

Rocky River Accommodation departs 7:40 a. m.; 1:40 p. m.

Euclid Accommodation departs 6:20 a. m.; 4.55 p. m.

All trains daily, except Sunday.

Cleveland & Pittsburgh.

	Arrive.	Depart.
New York Express	12 50 p m	8 00 a m
New York Express	6 35 p m	1 05 p m
Alliance & Akron Accom	9 40 a m	3 25 p m
Ravenna Accommodation	8 25 a m	5 00 p m
Night Express	*5 25 a m	*11 10 p m

*Daily; all other trains daily, except Sunday.

Mt. Vernon & Pan Handle Route.

C., A. & C. Ry. Co.	Arrive.	Depart.
Akron, Col. & Cin. "Flyer"	5 40 p m	8 10 a m
Akron, Col. & Cin. Night Express	7 00 a m	8 00 p m
Akron, Col. & Zanesv'e Ex	12 50 p m	1 05 p m
Akron & Orrville Accom	9 40 a m	3 25 p m

The 8 p. m. train runs daily. Elegant Pullman palace sleeping cars attached. All other trains daily, except Sunday.

Erie Railway.

Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express	‡5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo		†6 40 a m
Pittsburgh Express	†6 25 p m	
Youngstown Local	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom		†4 30 p m
Pittsburgh Express	†1 20 p m	11 10 p m
New York Express	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.
Canton and intermediate stations (Sundays only), 8:00 a. m., 4:20 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m., 6:30 p. m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a m, 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.
Canton and intermediate stations (Sundays only), 9:55 a. m., 6:30 p. m.
Trains marked * run daily.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA.

Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail	*7 40 a m	*6 20 p m
Marietta Express	†11 15 a m	†2 20 p m
Valley Junction Express	*4 15 p m	*10 15 a m
Cleve. and Canton Express	*7 00 p m	†8 10 a m

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Uhrichsville Express	4 00 p m	9 20 a m

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No. 62, Accommodation	† 6 05 a m
No. 72, New York Express	* 8 10 a m
No. 72, Fast Pittsburgh Express	* 8 10 a m
No. 64, Fast Pittsburgh Express	* 3 00 p m
No. 66, Mantua Accommo	* 4 20 p m
No. 68, New York Vestibule Limited.	* 8 30 p m
No. 70, Pittsburgh Local Express	*11 25 a m
No. 74, Pittsburgh & Youngst'n Ex.	†11 00 p m
	Arrive.
No. 65, Fast New York Express	*10 15 a m
No. 61, N. Y. & Pittsburgh Express	* 7 15 a m
No. 71, Leavittsburg Local	† 2 10 p m
No. 67, Pittsburgh Express	*12 45 p m
No. 63, New York Express	* 6 50 p m
No. 63, Pittsburgh Express	* 6 50 p m
No. 69, Pittsburgh Local Express	† 9 10 p m
No. 73, Mantua Accommo	* 7 20 p m
No. 75, Pittsburgh & Youngst'n Ex.	† 2 55 a m

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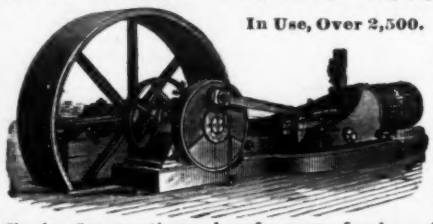

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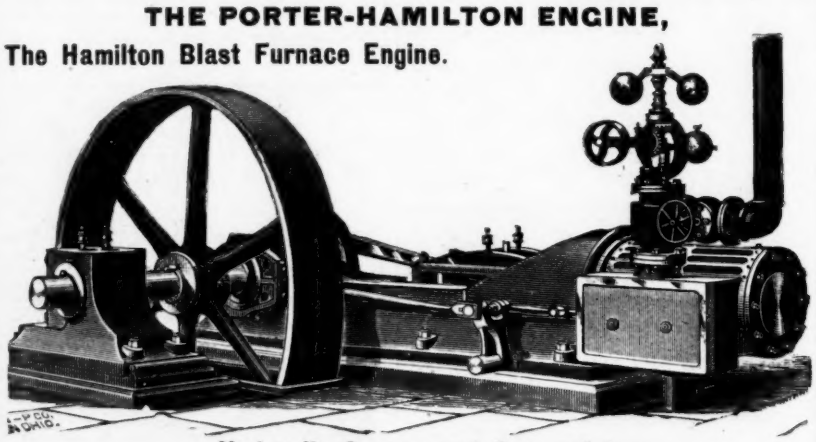

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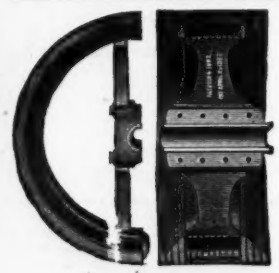

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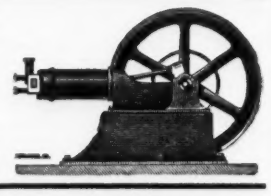

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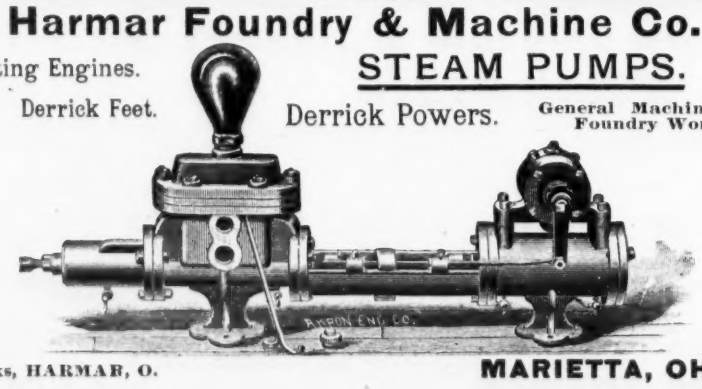

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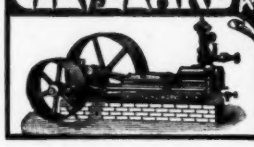

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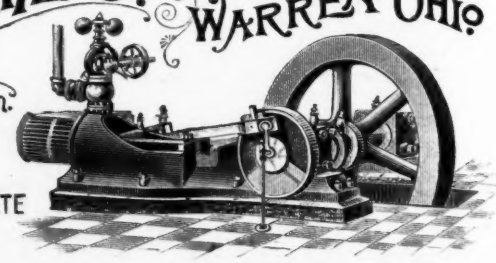

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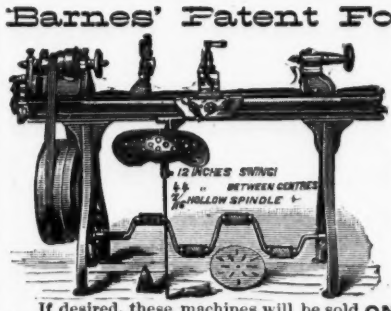

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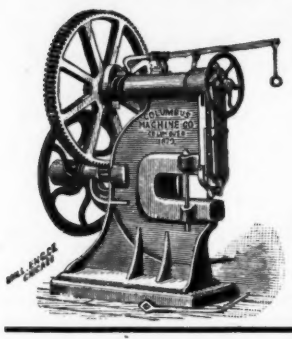

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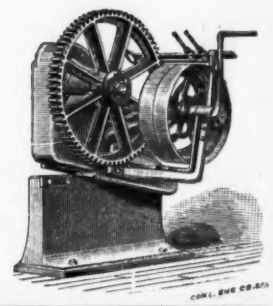

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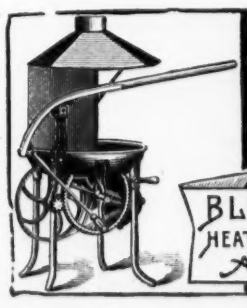

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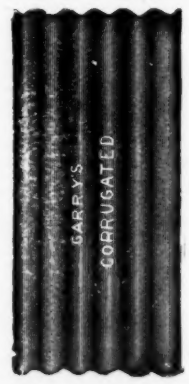

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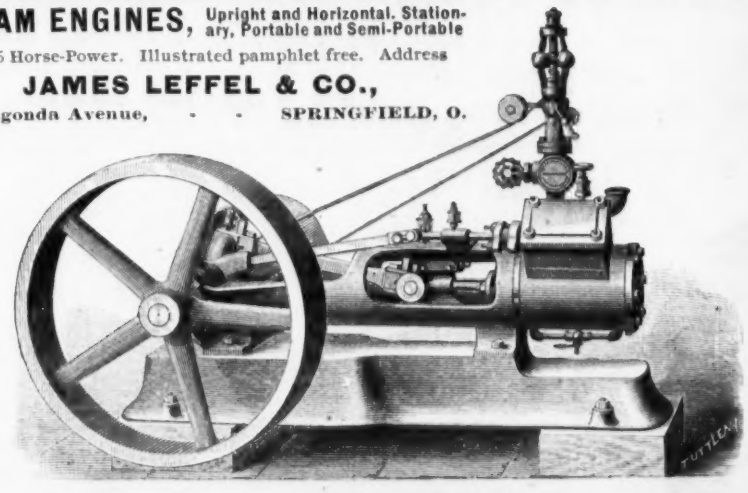

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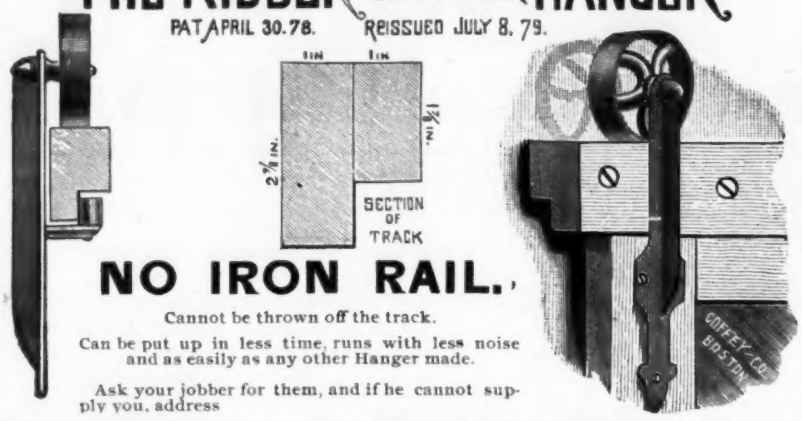

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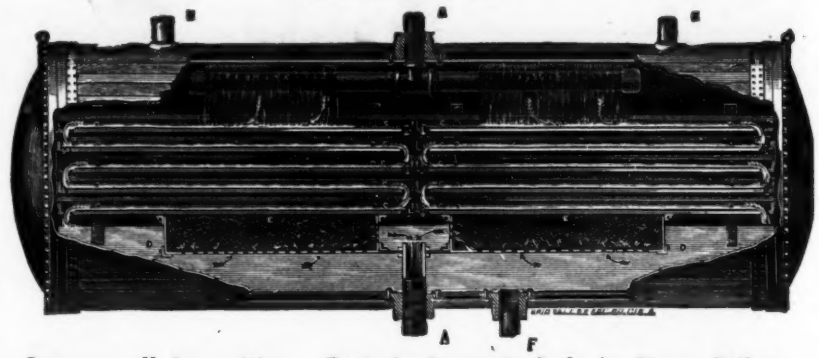

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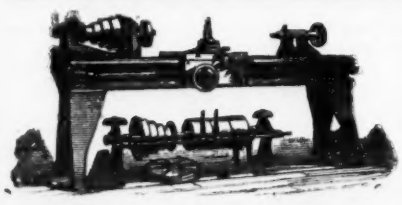

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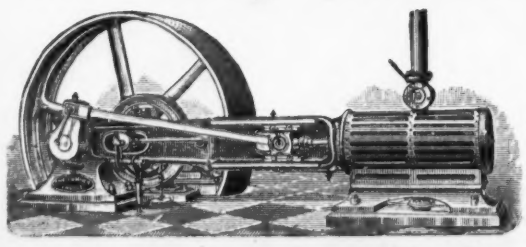

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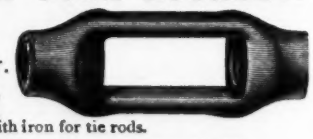

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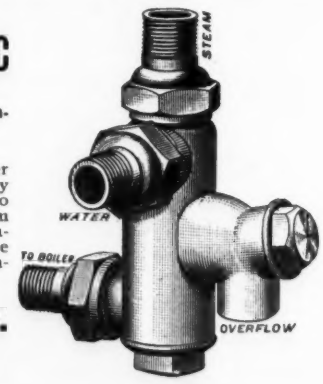

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